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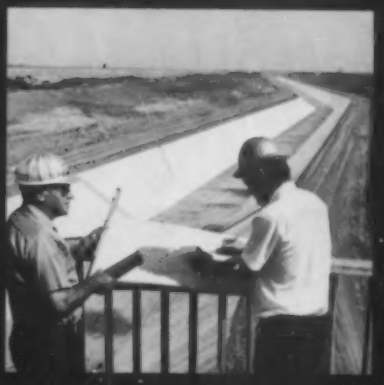

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RECLAMATION

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Cover
Reclamation's 75 years of water resource development have brought about vast changes in the lives of Westerners.

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WATER FOR THE WEST
THE BUREAU OF RECLAMATION
1902-1977

by Michael C. Robinson

Before the dawn of recorded history, primitive hunters and food gatherers in the Old and New Worlds founded settlements near irrigated fields that provided food and fiber. Within those small communities, man first learned that survival in arid regions depended upon cooperative conservation and sharing of scarce water supplies. The Federal reclamation program is a product of this age-old process—men and women working together to husband and manage water in the public interest.

Reclamation Origins

Prior to European settlement, the dry southwestern United States was dotted with small, widely dispersed agricultural settlements. Over many centuries, Indian farmers developed water management practices that enabled them to survive despite the limitations of the natural environment. At first, crops were planted in soil moistened by seeps and small springs. Gradually, simple water-control measures evolved. Rock check dams were constructed across ravines and gulches to trap alluvium and water for plots of maize, beans, and squash. Hohokam Indians created an extensive canal system that irrigated thousands of acres along the Salt River in southern Arizona. Thus working together, the first settlers of this arid

Michael C. Robinson, Research Coordinator, Public Works Historical Society, is currently engaged in a pilot history project for the Bureau of Reclamation.

A single man, his team, dog, and water held promise for a prosperous future on the Shoshone Project, Wyo.

Spanish priests enhanced Indian water conservation practices.

region created a way of life by carefully husbanding water resources.

In the 17th and 18th centuries, Spanish explorers and missionaries founded a chain of colonies stretching from Texas to California. The Spanish priests adopted and then enhanced Indian water conservation practices by building masonry dams and small stone and earthen reservoirs.

Water storage increased the flexibility and efficiency of irrigation systems and ensured a stable water supply. Mission and presidio sites were determined by the availability of water. Near the small settlements, *acequias* (community ditches) were cooperatively built and maintained to irrigate verdant fields of fruit trees, wheat, corn, beans, melons, squash, and peppers.

Tile conduits carried domestic water to laundry tanks, patio gardens, and cisterns. Water-powered gristmills ground flour and *norias* (revolving chain-and-bucket devices) lifted well and canal water onto adjacent lands. When American pioneers began moving westward, they discovered a thriving Spanish civilization already in existence.

The Mormons,* who settled the Salt Lake Valley in the late 1840's, were the first eastern Americans to establish an agricultural economy based on irrigation. Their success stemmed from their zeal and dedication to working with one another. The Utah settlement pattern—small villages surrounded by intensively cultivated fields—maximized the community cohesiveness needed to plan, construct, and maintain canal systems and other irrigation works.

Mormon irrigators diverted water from small streams and dug canals that transported it to fields of grain and vegetables. The settlers worked out methods of applying irrigation water evenly and in beneficial amounts over undulating tracts of former desert. They discovered the relationships between soil and seed types, and they pioneered irrigation practices that promoted maximum yields on terrain with varying slopes, soil texture, and mineral content. Throughout the West, other irrigation colonists profited from the experiences of Utah pioneers who demonstrated that homesteaders could flourish "under the ditch."

Unfortunately, few areas in the West could be easily irrigated. Congress reformed public land laws after the Civil War

* See the article "The Hatches of Scipio" appearing on page 72 in this issue.

to encourage settlement in this largely uninhabited region, but the programs were poorly planned and beset with speculation and fraud. Irrigation development exceeded the financial resources of homesteaders and much of the West remained unpopulated. Strife caused by conflicts over land tenure and water rights, plus a series of crop failures, hard winters, and droughts in the 1880's and 1890's, dashed the hopes of families striving to survive on western farms.

Unfortunately, few areas in the West could be easily irrigated.

Large private reclamation enterprises rarely succeeded beyond areas where streams could be simply diverted. Promoters had neither the capital nor engineering capabilities to build large storage dams and irrigation works. Profiteering, chaotic western water laws, and a severe depression in the 1890's dried up investments and slowed irrigation development to a standstill.

Gradually, a movement began that stressed Federal reclamation as a means of settling the West and strengthening the family farm. John Wesley Powell was the father of this crusade. As early as 1878, he urged Congress to adopt a program that would enable western homesteaders to store spring floodwaters for irrigation during the dry summer growing season.

Under Powell's direction, the Geological Survey conducted surveys of the arid region, marked off potential dam and reservoir sites, and mapped proposed canals and ditches.

During the 1890's, public opinion solidified behind the movement because of the efforts of reclamation advocates. William E. Smythe organized National Irrigation Congresses that focused attention on the problems of aridity. Men such as Charles D. Walcott and Frederick H. Newell, of the Geological Survey, pressed for Federal reclamation from within the Government. George H. Maxwell founded the National Irrigation Association and launched a nationwide publicity campaign to promote Federal construction of dams and irrigation works. Finally, Nevada Representative (later Senator) Francis G. Newlands sought congressional approval for reclamation legislation. By the turn of the century, the public works program was receiving substantial support throughout the country.

Major John Wesley Powell conducted surveys of the West, marking potential dam and reservoir sites.

The Reclamation Service, 1902-1923

President Theodore Roosevelt signed the Reclamation Act on June 17, 1902. This law launched a progressive program that employed Federal engineering as a tool for social progress. Its authors envisioned barren lands being transformed into productive farms that would support new homes and communities.

The statute dedicated the proceeds from public land sales to a revolving "Reclamation Fund" that financed water storage and diversion works in 16 Western States and Territories (Texas was added in 1906).

Irrigable public lands were subject to entry under the 1862 Homestead Act, with each settler obligated to repay his proportionate share of construction costs in 10 years. Local water user associations would assume operation and maintenance responsibilities once half of the repayment obligations were met, but the Federal Government retained title to major works. State and territorial laws governed the appropriation, use, and distribution of project water. Although in theory the act applied to reclaiming the public domain, many acres of project land were already privately owned. Therefore, landowners of a maximum of 160 acres were offered water rights for purchase.

The Reclamation Act authorized the Secretary of the Interior to carry out the program, but established no organization to do the work. The Secretary created a Reclamation Service within the Hydrographic Division of the Geological Survey since Survey personnel were already familiar with the topography and water resources of the arid West. In 1907 the Service gained independent status within the Department.

The program went forward from 1902 with astonishing speed. Twenty projects were authorized the first 3 years. Survey parties were outfitted with provisions and pack animals and sent into the field to acquire hydrologic and geologic data.

The great work of transforming the desert commenced.

These pioneer engineers recorded streamflows, studied drainage basins, and determined the size of dams and storage reservoirs needed to support irrigated farms. Early Reclamation projects were often built in remote areas far from railroads and sources of labor and materials. Men, machinery, and supplies were hauled to damsites in wagons over rough desert trails. Tent cities sprang up to house engineering and construction personnel, and the great work of transforming the desert commenced.

The first cabin of Grand Junction, Colo., and two early citizens, R. D. Mobley and Mrs. Jackson, 1881.

From 1902 to 1923 the Reclamation Service perfected the organizational procedures and techniques required to execute Reclamation policy. Its dams stood as monuments to the agency's engineering expertise. In an era when dam failures were common, Reclamation's structures set high standards for safety and design competence. Public works such as Theodore Roosevelt Dam in Arizona, Elephant Butte Dam in New Mexico, and Arrowrock Dam in Idaho affirmed Reclamation's reputation as the world's leading builder of water storage and irrigation facilities.

Once water was delivered to public lands, prospective homesteaders drew lots for farms, built austere homes, plowed and leveled the desert, dug irrigation ditches, and began their struggle to carve out a livelihood. In a few years, fields of sugar beets, alfalfa, potatoes, grain, and fruit trees grew on former desert which had been reclaimed by hard work and water from Reclamation reservoirs and diversion structures. Spacious and landscaped farm houses gradually replaced cramped shacks, and nearby communities prospered from the economic base provided by irrigated agriculture.

Spacious and landscaped farm houses gradually replaced cramped shacks, and nearby communities prospered.

Despite much success, many project homesteaders were plagued by economic hardships. Among other factors, speculation, lack of irrigation experience, poor soil conditions, soaring construction costs, and low crop prices caused despair and failure. Congress provided relief in 1914 by extending the repayment period from 10 to 20 years, but many water users remained unable to defray construction costs and make even a subsistence living.

In the face of these hardships, Reclamation worked with the water users to enhance their irrigation and farming skills. Project managers provided irrigators practical information, and articles in the *Reclamation Record* (the forerunner of *Reclamation Era)* were an important source of advice. To improve local communities further, the Service

The U.S. Reclamation Service train, a steam engine, ran from Boise to Arrowrock Dam, 1912.

assisted in planning and constructing roads, bridges, schools, and other public facilities.

As with the Indians, Spanish, and Mormons, successful adaptation to the arid environment depended on community cohesion. A spirit of self-help through cooperation prevailed on many projects. Womens' organizations and 4-H clubs provided social outlets. Cooperative creameries, canneries, and grain elevators were established by project settlers, and associations were founded with Reclamation assistance to market livestock, fruit, and other agricultural commodities.

Multipurpose Development, 1924-1939

A post-World War I agricultural depression severely crippled the Reclamation program. In response, Interior Secretary Hubert Work appointed a special Fact Finders Committee in 1923 to make an exhaustive analysis of Reclamation and recommend policies that would promote fiscal stability. The same year he renamed the agency the Bureau of Reclamation. Under the leadership of Commissioner Elwood Mead, the Bureau reoriented its policies and increased its emphasis on human needs during the 1920's.

Congress was persuaded to schedule repayments on the basis of land productivity and construction charges were written off for some unproductive lands. Project feasibility requirements were tightened, prospective irrigators were required to meet basic standards of capital and experience, and project operations were turned over to water user organizations. These reforms increased repayment revenues and reduced settler hardship and discontent.

During this period, the Bureau became a multipurpose water agency. Reclamation leaders and other progressive conservationists viewed water as a resource whose major uses could be coordinated scientifically. They recognized that flood control, municipal and industrial water supply, and generation of hydroelectric power could be integrated within a river basin into a single multipurpose plan.

In spite of the agency's initial single-purpose mission, early Reclamation projects were test cases for this philosophy. Before 1920, Reclamation reservoirs were used for hydroelectric power production, municipal and industrial water supply, fish and wildlife enhancement, and recreation. Reclamation supporters were especially interested in power generation, for they realized power revenues could help liquidate construction costs.

Congressional approval of the 1928 Boulder Canyon Act placed the Bureau in the forefront of multipurpose development. While construction of Hoover Dam commenced on the Colorado River, the agency began preparing plans for the Columbia Basin Project, which was another endorsement of public power and a critical step toward basinwide development of river systems.

Ironically, some of Reclamation's greatest achievements occurred during the Depression.

The Bureau reoriented its policies and increased its emphasis on human needs during the 1920's.

During Franklin D. Roosevelt's administration the Bureau played a key role in Federal efforts to help alleviate unemployment and restore economic stability through programs of public works construction. Virtually overnight the agency had more money at its disposal than the total expenditures during the program's first three decades. During the 1930's, Public Works Administration funds and general revenues supported a huge construction program.

In signing the Reclamation Act of 1902, President Theodore Roosevelt created the Reclamation Service.

The Uncompahgre Project Office crew (1906) at Lujane, Colo., played a role in completing Reclamation's first tunnel, Garrison Tunnel.

Earlier studies culminated in the inauguration of the Columbia Basin, Central Valley, and Colorado-Big Thompson Projects. By 1940, 13 major storage dams —including Grand Coulee and Shasta—were under construction and some 160,000 acres of new land had been irrigated. Revenues from hydroelectric marketing stabilized Reclamation financing, and cheap power attracted industry to the West, improving the lives of millions of people.

Despite these engineering triumphs, the Bureau retained its fundamental commitment to small farmers. Many water users were burdened with repayment obligations and private indebtedness, while drought and low farm prices inhibited their ability to repay. Several repayment moratoriums were granted, and in 1937 a Repayment Commission was formed to recommend effective relief measures.

Its findings led to the 1939 Reclamation Project Act that established more flexible repayment schedules and granted water users a maximum of 40 years to defray construction costs. No repayments were required during an initial 10-year development period. Furthermore, the act incorporated multipurpose objectives into basic Reclamation law and ensured the program's permanence once emergency relief funding stopped.

Reclamation had a tremendous social impact during the Depression. Thousands developed job skills while working on Bureau projects. Civilian Conservation Corps (CCC) camps were established that enabled young people to rehabilitate old structures and construct new irrigation works.

The Bureau cooperated with Federal and State agencies to coordinate water conservation efforts and enhance the recreation and fish and wildlife benefits of Reclamation reservoirs. In addition, the agency worked closely with the Department of Agriculture on New Deal drought relief and resettlement programs that rescued farmers from bankruptcy and despair.

Thus, the adoption of multipurpose planning served fundamental Reclamation objectives. The conservation of western water for full utilization in the public interest remained the agency's paramount goal. Policies changed and the organization expanded, but the democratic ideals remained unchanged—to promote the stability of the family farm, to build and safeguard homes.

Reorganization and Expansion, 1940-1960

Reclamation projects contributed to the Allied victory in World War II. Irrigated agriculture helped meet increased demands for food and fiber, and the Bureau's hydroelectric capacity expanded to keep pace with the requirements of burgeoning defense industries throughout the West. During the war, Reclamation power accounted for 84 percent of increased electrical power in the 11 far-Western States. Moreover, the 30 hydroelectric plants on Bureau projects made the agency one of the largest power producers in the world.

By the early 1940's, the Reclamation program had grown so large and complex that it was becoming increasingly difficult to administer under a line organization. The agency was reorganized in 1943, under the leadership of Interior Secretary Harold Ickes, to make it more responsive to the specific requirements of different western areas.

Regional offices were established in the major drainage basins to decentralize investigation, planning, construction, and operation and maintenance activities. This reform brought the Bureau closer to the public and promoted reciprocating exchanges between agency personnel, State and local agencies, water user organizations, and the general public. Reclamation has since developed a decentralized and national character—responding to regional needs as well as retaining a balance between regions in the national interest.

At this time, the Bureau also entered upon a new stage in the evolution of multipurpose planning, considering an entire river basin development scheme as a single integrated project. By pooling costs and anticipated revenues (especially power sales), single projects could be justified that were otherwise not feasible. Thus, integrated programs were formulated for areas such as the Missouri and Upper Colorado basins, as well as for California's Central Valley. The famous Pick-Sloan Plan for the Missouri River drainage area, the initial stage of which was authorized in the 1944 Flood Control Act, was the first multipurpose river basin program participated in by the Bureau. Many of the irrigation works were to be built after flood control, navigation, and hydroelectric features were completed.

The Colorado River Storage Project, authorized in 1956, enabled the upper-basin States to utilize their share of the river's water. The major storage dams of this project were stellar achievements of modern Reclamation engineering and construction—Glen Canyon on the Colorado River in Arizona, Flaming Gorge on the Green River in Utah, Navajo on the San Juan River in New Mexico, and Blue Mesa, Morrow Point and Crystal Dams on the Gunnison River in Colorado. The agency's hydroelectric transmission grids evolved into basinwide systems and interregional power interties involving cooperation between public and private entities.

Decentralization expanded the scope and impact of the agency's operation, maintenance, settlement, and water conservation activities. By being close to the job, regional and local offices could recognize and understand local problems, develop personal relationships with water users, and promote water conservation and irrigation efficiency. The Bureau upgraded assistance to settlers in the Columbia Basin and other projects. It also undertook the rehabilitation of old structures, stepped up soil classification, and established demonstration farms that exhibited effective irrigation techniques and cropping practices. Bureau staff also worked with water users to control weeds, check seepage by lining canals, and develop sedimentation abatement programs. In addition, increased emphasis was placed on turning over operation and maintenance functions to water user organizations.

These two decades also witnessed an expansion of multipurpose planning concepts to include new project purposes. The 1946 Fish and Wildlife Coordination Act permitted allocations of nonreimbursable project costs to the preservation and propagation of fish and wildlife. This new dimension was strengthened by a 1958 statute that placed expenditures of Federal funds for this purpose on equal terms with other water resource development functions.

Western urbanization after World War II increased public use of Reclamation reservoirs for recreation activities such as camping, fishing, swimming, boating, and picnicking. Reclamation expanded cooperative agreements with the National Park Service, Forest Service, State agencies, and local concessionaires to provide additional recreation facilities at reservoir sites. Recreation benefits received more support under the 1965 Federal Water Project Recreation Act, which called for full consideration of recreation and fish and wildlife activities in the planning of all future water resource development programs.

Young families like that of Mr. and Mrs. Kenneth Hampton and Kathleen reaped great benefits from Reclamation's assistance to settlers, 1947.

Reclamation's broadened mission included an increased commitment to foreign activities. Since the 1920's, foreign engineers and technicians have been participating in job training programs and study tours at Reclamation facilities throughout the West. This effort expanded as the United States foreign aid programs proliferated after World War II. Many foreign engineering organizations are now staffed with Bureau "alumni." Highly skilled personnel were in demand for short term details throughout the world. Technical teams of experienced Reclamation engineers, agricultural experts, and economists were sent to countries such as Egypt, Afghanistan, and Ethiopia to assist on water resource projects. Reclamation laboratories were also utilized to support public works activities abroad.

During this period, the Bureau once again demonstrated its responsiveness to changing western needs. Multiple-resource river basin planning had transformed the West by creating opportunities for homes and jobs. By 1960 the agency was poised to enter upon a new era of water planning and development.

Environmental Challenges, 1960-1977

The basic mission of the Bureau of Reclamation has been the achievement of economic and social objectives through the development of water and related land resources. In the past two decades, however, there have been far-reaching changes in natural resource concepts. The Reclamation program has broadened from the components of multipurpose planning to a full consideration of man's total relationship with his environment. Environmental quality, along with the general quality of western life, have become paramount concerns.

Reclamation became increasingly embroiled in controversy because of the explosiveness of environmental questions. Turmoil, of course, was not new to Reclamation. In the past, public and congressional battles had been waged over the 160-acre limitation, crop surpluses, public versus private power, and the intrusion of reservoir water upon national parks and monuments. More recently, projects have been assailed because of destruction of historic and scenic areas and adverse effects on fish and wildlife habitats. Traditional beliefs that advocated careful management of all resources to promote economic and social betterment have been challenged from an ecological viewpoint that opposes further changes in the natural environment. Many groups and individuals desire to curtail growth and claim the regional ecosystem cannot withstand the adverse impacts of additional water projects.

Since 1970 the Bureau has been using environmental impact statements (EIS) as a planning tool in accordance with the 1969 National Environmental Policy

While seeking to develop water resources, Reclamation has also been deeply concerned with the Nation's environment.

Act. EIS studies have broadened the spectrum of considerations used to plan and analyze the feasibility of projects to include adverse impacts on wildlife habitat, endangered species, archaeological and historical sites, and scenic areas. New planning objectives include balancing economic growth and social well-being and protecting environmental resources. Local and regional offices have promoted public involvement programs that enlist local participation and review in Reclamation planning.

During this tumultuous period, Reclamation has been responsive to changing western needs. Due to rapid urban expansion, more projects have been built that supply cities with domestic and industrial water. Cities such as Wichita, Kans., and Amarillo, Tex., acquired dependable supplemental sources of supply as a result of Reclamation multipurpose projects. In determining the allocations of project costs, greater emphasis has been placed on flood control, recreation, and fish and wildlife habitat. Emphasis on irrigation has shifted from new land development to providing supplemental water to existing fields.

Shortages of food and water have advanced Reclamation into new areas of water management and augmentation. Project Skywater has been undertaken to test the potential of cloud seeding to meet short- and long-term water requirements.

Geothermal resource investigations are determining the feasibility of converting desalted geothermal brines into sources of fresh water and at the same time producing energy. Efforts are also underway to control salinity in the Colorado River to meet treaty commitments to Mexico and to sustain the quality of life in the basin.

Project Skywater has been undertaken to test the potential of cloud seeding.

In the early 1970's, a series of Total Water Management studies began in which all aspects of a river basin's water projects—existing, under development, and planned—are examined to determine if they meet social, economic, and environmental objectives. In 1970 the Bureau initiated the Irrigation Management Service, designed to improve irrigation efficiency on Reclamation projects. Irrigation applications are scientifically scheduled at proper times and in appropriate amounts to maximize effective water use and crop production.

The Bureau has also actively pursued its construction program to reduce a large backlog of authorized projects. Dams, canals, hydroelectric units, and related facilities have continued to be constructed throughout the West. Reclamation has expanded its record of world-renowned research accomplishments that improve the construction and operation of water resource

Weather Modification, an element of Reclamation's Total Water Management program, can bring more water to drylands.

public works. On the horizon loom new opportunities for alleviating energy shortages. Plans are being studied for building low-head generation units, expanding pumped-storage facilities, and tying solar and wind energy units into the Bureau's existing hydroelectric plants and vast transmission system.

In the final analysis, the magnitude of Reclamation cannot be grasped by citing statistics on crop production, numbers of dams, and miles of canals. Fundamentally, Reclamation is people helping people to create and preserve life-sustaining habitats in the once-barren West.

Unfortunately, in spite of its many accomplishments, the Bureau celebrates its Diamond Jubilee in the midst of uncertainty. The tragic failure of Teton Dam in June 1976 blemished the agency's excellent engineering and construction record. Since then the safety, as well as the economic feasibility and environmental impact, of some projects have been seriously questioned.

In its 75th year, Reclamation embarks on a new era led by a new Commissioner who has pledged careful consideration of dam safety, environmental protection, and economic justification in future planning while not losing sight of the need for resource protection and development.* Whatever the future holds, Reclamation has always demonstrated it can adjust to changing national and regional needs by building constructively upon its past. ea

* See article "New Directions for Reclamation" on page 48.

RECREATION WITH A SPLASH!

by Cassandra Larkins

Because of their unique location in arid regions, most Bureau of Reclamation lakes and reservoirs have been popular areas for outdoor recreation from the year they were completed.

Since the early 1900's, Reclamation has permitted fishing, boating, picnicking, swimming, hiking, and other recreational activities on its many projects. Several of these early projects have established excellent reputations as recreational areas.

The Theodore Roosevelt Dam, completed in 1911, was the first major structure built by the Bureau on the Salt River Project. Roosevelt Reservoir, located 30 miles northwest of Globe, Ariz., was perhaps one of the best

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A fishing enthusiast displays her catch, 1918.

advertised resorts in Arizona in the early 1900's. As one of the principal attractions of the Apache Trail, a popular auto route between Globe and Phoenix, this resort drew large crowds of visitors each year. About 1917, a large hotel was constructed along the shore of the lake near the dam to accommodate the increasing number of visitors. One of the many attractions of this area was the horseback trails used by thousands of riding enthusiasts each summer. Other recreational opportunities offered by this popular resort included boating and swimming.

Since the early 1900's, Reclamation has permitted recreational activities on its many projects.

Another popular recreational area in those early days was the Elephant Butte Dam and Reservoir on the Rio Grande Project in New Mexico, completed in 1916. Many of the Rio Grande Valley farmers enjoyed boating and fishing on this reservoir, located about 125 miles north of El Paso, Tex. The farmers also used the excellent camping accommodations provided by the Bureau.

Two artificial lakes on the Boise Project in Idaho—Deerflat and Arrowrock Reservoirs—were also favorite resorts. The Arrowrock Reservoir, completed in 1915, was easily accessible by auto, team, and trolley. This early Reclamation reservoir offered facilities for hunting, swimming, and fishing. Speedboat races and ice skating on the Deerflat Reservoir also attracted many tourists.

Early Minidoka Project farmers enjoyed using Lake Walcott, formed when the Minidoka Dam on the Snake River in Idaho was built. Picnic grounds with large trees that furnish plenty of shade were developed by Reclamation for the numerous tourists who visited the lake during the summer.

Innovative campers found that the "old buggy" could double as a tent support.

Shoshone Reservoir in Wyoming attained widespread popularity, mainly because of its location. Formed by the Shoshone Dam, the reservoir is situated at the head of a canyon in the heart of the Rockies, on what was then a new and scenic highway leading to Yellowstone National Park. The reservoir attracted many fishermen and hunters.

One of the major attractions of the Strawberry Valley Project in Utah during its early construction days was Strawberry Reservoir which was stocked with a variety of game fish. Many fishermen visited the lake each year.

In addition to providing excellent fishing opportunities, Strawberry Reservoir was a bird preserve. During the fall and early winter, ducks, geese, and other migratory birds on their way south used the reservoir for resting and feeding.

Other early projects were also used as bird preserves. The Salt River National Bird Reservation in Arizona was established in 1909. This reservation provided a resting and feeding place for migratory water birds and a safe nesting locality for the species that breed in that region.

Reclamation projects were also viewed as added attractions to visitors of the national parks in the West during the early 1900's. Because many Reclamation projects were in the immediate vicinity of the national parks, visitors were able to enjoy the scenic beauty of those parks in addition to recreational activities on Bureau projects.

For example, visitors touring Mount Rainier National Park in western Washington could also visit the Bureau's Yakima Project, known for producing thousands of acres of fruit each year. Visitors entering the Yellowstone National Park on the east were able to enjoy the Shoshone Project, with its 328-foot-high Buffalo Bill Dam.

Travelers visiting Lassen Volcanic National Park, in northern California, could also explore the Klamath Project and enjoy beautiful Klamath Lake. On their way to the Grand Canyon, travelers could visit the Salt River Project in central Arizona.

In 1936, the Bureau entered into its first agreements with the National Park Service to develop and administer several recreation facilities: at Lake Mead on the Colorado River between Arizona and Nevada, Grand Coulee Dam in Washington, and Shasta and Millerton Lake, in California. Under the agreements, the National Park Service would enforce safety regulations and provide facilities for tourists and sightseers through concessionaires.

Since 1944, the Bureau has given special consideration to the recreational potential in all of its project investigations. The National Park Service and the Fish and Wildlife Service investigate the proposed projects and make recommendations to Reclamation. These recommendations are incorporated in the Bureau's project reports so that proper consideration may be given to the recreational aspects of each project proposed.

Today, of the 264 recreational areas created on Reclamation projects, 240 have been transferred to other Federal and non-Federal agencies for management and further development. Reclamation managed only 24 in 1975. State governments administered 105; the United States Forest Service, 47; county governments, 33; water user organizations, 19; the Fish and Wildlife Service, 15; the National Park Service, 13; the Bureau of Land Management, 1; and other organizations, 7. Collectively, 164 were administered by non-Federal agencies and 76 by Federal agencies other than Reclamation.

Attendance at Reclamation facilities increases each year. A record total of 64.7 million visitor-days was reached in 1975, an increase of 900,000 over 1974.

A record total of 64.7 million visitor-days was reached in 1975.

There were 14 Reclamation recreational areas with over a million visitor-days each in 1975. Lake Mead, including Hoover Dam, proved to be the most popular area with 6.9 million visitor-days.

Millions of people vacation at Reclamation facilities for a variety of reasons—water skiing, boating, swimming, sailing, fishing, hiking, bicycling, picnicking, and sightseeing on the land surrounding these lakes. Camping is also a popular activity. Many people enjoy "roughing it" on Reclamation recreational grounds. But summer is not the only time of the year visitors can enjoy outdoor recreation. At some of the reservoirs, winter sports such as ice fishing, winter hiking, and winter camping are growing more popular.

Visitors and local citizens alike receive many benefits from Reclamation recreational facilities. For example, people living near Reclamation projects can save the high cost of transportation by enjoying water-based recreation and vacations close to home. Also, land near Reclamation reservoirs is prized by those who like to have vacation homes near bodies of water.

Recreational activity also offers many benefits to local communities. These activities increase retail sales of goods and services, jobs for the local people, tax revenues, and land values.

Boaters on Lake Roosevelt, 1909.

NEW LANDS FOR VETERANS

by K. K. Young

Over 3000 veterans wait for a chance on one of 224 farms in Torrington, Wyo., 1921.

Twice during its 75-year history Reclamation has made two extensive studies on what it could do to help the Nation after World Wars I and II. One solution was to help the veterans by giving them land.

The practice of giving away land owned by the Federal Government to veterans as partial compensation for their effort actually started with the Revolutionary War. The colonies could not pay the volunteers but they could promise land in varying amounts according to their rank in the army. These promises were valid even for the survivors. By the time the arid West was opened up to homesteading, there was quite a backlog of veterans and their survivors who were eligible to file for homesteads. Long before the 1902 Reclamation Act was passed, 160 acres had been fixed as a reasonable amount of land for each applicant since that was about all one family could farm effectively.

K. K. Young, a 40-year employee of the Bureau of Reclamation, retired in 1973 as Chief, Division of General Engineering, Washington, D.C.

After receiving his homestead in Oregon, this World War I veteran and his wife began to carve a home out of the sagebrush land.

That was a reasonable conclusion since the main source of energy was horsepower in the flesh and the first automobile had not yet made a cross-country run.

During the 1880's very strong feelings arose over the disposition of western lands. Even then there were disputes over whether businesses should be able to exploit the land and its resources, or whether there should be conservation of water, land, timber, and minerals.

In general, the States wanted to control the lands to be disposed of as a source of revenue. Politics in the States were usually controlled by men with large natural resource holdings. Nevertheless, at the Federal level whatever was decided usually was in favor of the Nation as a whole.

During this time, the forerunner of the Bureau of Reclamation, the Geological Survey, was following the recommendations of John Wesley Powell by measuring the flow of water in the principal streams, surveying the land to determine the drainage area and to spot reservoir sites, and acquiring data on climate, geology, soils, and crops. Much of the bottom lands had already been acquired and farmed. Experience had proven that for irrigation farming to be more than a gamble, water storage was necessary.

By the time the Reclamation Act was passed, irrigators had recognized the need for storage

facilities and made application for Federal assistance. To qualify, they had previously agreed to give up irrigable lands held in excess of 160 acres and to pay the cost of the dam, reservoir, and other necessary facilities within a fixed time (at first it was 10 years, later 5 years). They also agreed to operate and maintain the facilities on their own and at their own expense after half the construction costs were repaid. The new law continued the policy of giving preference to veterans or their survivors from earlier military conflicts, including the Spanish-American War and several campaigns against the Indians.

Giving away Federal land began with the Revolutionary War.

By 1914, Reclamation had work underway on over 22 projects. On these over 1.2 million acres were irrigable lands and over 760,000 acres of land were irrigated and producing annually over $16 million in crops. On the basis of 160 acres per holding this equals over 7,000 independent farmers—many of whom were veterans.

Within the next 5 years, 8 new divisions of projects were authorized by the Congress for development on which the storage facilities were already started or completed. Concurrent with these authorizations the international involvements were heating up. War was imminent. In April 1917, the United States entered World War I.

Reclamation's principal activity as a part of "the war effort" was to concentrate all of its energy upon food production. All other construction was halted. Every kind of assistance permitted by law was extended to farmers. In fact, where equipment and help were available and could be spared, land plowing and leveling were performed for farmers at cost and they were supplied with seed. If transportation was not available when needed, Reclamation cooperated by helping in the construction of storage cellars to save perishable crops. Of course, every effort was made to keep the reservoirs, canals, and laterals in the best condition to assure continuing water delivery to the irrigated areas.

Additionally, new lands were opened for production as soon as possible. The *Reclamation Record* (now the *Reclamation Era)* played an important role by presenting to its 17,500 subscribers numerous articles discussing Reclamation's war efforts.

With a slowdown in construction, many men were freed for other service. During this period women were employed on survey parties and often served as powerhouse operators and at other posts previously held by men.

By early 1918 the Government became concerned about providing work and homes for returning soldiers. It was proposed, and money was appropriated, to investigate the reclaiming of lands by draining areas outside of existing projects, as well as reclaiming cutover timberlands in any State in the United States. To accomplish this assignment, a special organizational unit was established, under the direction of Reclamation's Director and Chief Engineer in Washington, D.C. This activity was called "Investigations of Swamp and Cutover Lands in the United States" and was divided into the Northern, Southern, and Western Divisions, the latter being under the supervision of the Denver office. The objective was to locate lands which through reclamation could be converted from wastelands into lands capable of sustaining a prosperous rural population. This needed to be done at a cost which a veteran could be expected to repay over a long period with a low interest rate.

The concept went far beyond a piece of land for a veteran. Extensive cooperation by the Federal Government with the returned soldier would also provide for community centers, church and school sites, and a system of good roads. Standard plans for a variety of dwellings to suit young family needs were developed for the do-it-yourself homeowner. These returning soldiers would work on the project development at the going wage as employees of the Government. They would also be assisted by the Government in breaking and leveling the land and seeding the first crop. Those who worked on the project would be given preference in the selection of homesteads.

Local communities and States became involved to such an extent that questionnaires were distributed to soldiers at various camps and over 75,000 interested men replied. While complete results of that survey are not available, it is certain that many exservicemen were interested in obtaining a homestead. For instance, in 1920 there were 3,298 applications by veterans for 80 parcels of irrigated land in Wyoming. Each man made a $500 deposit.

During the years between the truce in 1918 and the actual peace treaty signing in 1921, some of the returning exservicemen were able to acquire homesteads and obligate themselves to the repayment. Unfortunately, following the elections in 1922, industrial readjustment after the war and a high rate of unemployment brought about a minor depression.

The Teapot Dome scandal (which involved the Secretary of the Interior), and the subsequent realignment of the top staff of the Bureau of Reclamation, resulted in a period of what seemed to be slow growth. Perhaps it only seemed slow after Reclamation's fast start. Reclamation had been involved in a national planning effort between 1920 and 1930 that included at least a dozen new projects or new divisions of existing projects authorized by the Congress.

Also during this period the Bureau was deeply involved in planning the Boulder Canyon Project on the Colorado River and in developing the Grand Coulee Project in Washington.

Finally, the first crop nears maturity.

In 1920, 3,298 veterans applied for 80 parcels of land in Wyoming.

Meanwhile, the economic depression and a drought in the West were causing hard times and political problems. One form of dissatisfaction was manifested by the veterans' march to Washington and their camp-out near the Capitol lawn. They were World War I veterans, seeking assistance some 14 years after the Armistice. To overcome the economic stagnation, an extensive public works program was authorized under the National Recovery Act. Under this program several projects were authorized and veterans were

given preference in all phases of employment and transfer of land. The Reclamation project which offered the greatest opportunity for veterans was the Columbia Basin Project, involving over 1 million acres and possibly 4,700 farms. (See the article "Veteran Farmers of the Columbia Basin" on page 23.)

Projects the size and complexity of the Columbia Basin take many years of construction before land settlement can begin. Unfortunately, World War II started which slowed down all Reclamation work. Now, only those projects which could produce food or furnish hydroelectric power for purposes of war production were permitted to continue. So the development of homesteads was delayed, but Reclamation again made important contributions to the country's war effort by furnishing electric power to west coast and northwestern industries which were producing aircraft and naval vessels.

Soon national leaders became concerned over the possibility that if the war were suddenly ended there would be a quick and large influx of returning servicemen and a sizable reemployment problem.

To be prepared, plans were developed for a large public works program. Reclamation was asked to determine what it could contribute to such a program. Irrigation projects that had been investigated as potential developments and those not yet completed were studied to determine the type and amount of work involved in each. (Some might involve the development of farm land by pumping from ground water while others might require construction of large dams, powerplants, and canals.) The amount of work was converted into the man-years required at the site to do the necessary construction and the off-site man-years to produce cement, steel, and turbines to be used on the project. The results of the study were impressive. They showed that while all of the construction was to be in the 17 Western States, all States received some benefits from the expenditures, although the central and eastern industrial States would benefit most in the off-site employment.

Many of the projects covered in this inventory, as proposed by Reclamation and the Corps of Engineers, were in the Missouri River drainage basin. The joint plan, known as the Pick-Sloan Plan, was approved for construction late in 1944, just before the end of the war.

Other large and incomplete projects which could also provide employment were the Columbia Basin, Colorado-Big Thompson, Central Valley, Davis Dam, etc. Everyone realized that to resume a large public works program and to provide jobs quickly would be a monumental task.

When peace was declared in 1945 and the public works program began to build up momentum, Reclamation contributed significantly to providing jobs for returning veterans and to making irrigated farms available for homesteads.

VETERAN FARMERS OF THE COLUMBIA BASIN

by Clint Amo

Alice and Hank Tessitore.

The story of Henry and Alice Tessitore is typical of most of the 1,000 veterans and their families who selected federally owned farms under the Columbia Basin Project's land settlement program following World War II and the Korean Campaign—about 20 percent of the total number of farm families on the project.

Hank Tessitore served in the U.S. Army in 1945 and 1946. While being processed out of the Army, he heard of the project from a captain who spoke about the opportunities for young veterans with an interest in farming.

Clint Amo retired from the Bureau of Reclamation in 1976. For several years he administered the Project Settler Selection Program for the Columbia Basin Project, Wash.

Hank plows the asparagus field.

The captain explained that the primary purpose of the land settlement program was to provide farming opportunities for families who wished to live on the land. By so doing, they would help bring about early development of newly irrigated areas and would encourage the development of roads, schools, postal service, and other community services. The success of the program is eloquent testimony to the fortitude and capability of the many settlers, typified by Hank and Alice Tessitore and their family.

In 1950 Hank and Alice made their first trip to the Basin. Even then, 2 years before water flowed through the project irrigation system, Hank could see the great potential of the project. He had been farming in Colorado with his father, an immigrant from northern Italy. Things were not too easy there, because the area was limited by a short growing season and the high cost of shipping.

In the early days Hank's father preserved the farm by digging deep drains in the adobe soil. "The adobe was so sticky," Hank recalls, "that my father would hand a shovel full of muck up to my mother, who would hand him a clean shovel and then scrape the clay off the other." His parents still farm a small acreage there, but most of the land in the area is now used for recreation or municipal purposes.

In 1955 Hank and Alice selected a small farm unit in the southern part of the project, some 15 miles north of the town of Pasco, Wash. It was one of 82 units offered under the 16th public notice released on the project. The notice offered the farm units for sale at Government-appraised dryland prices. (A total of 37 sales notices were eventually issued on the Columbia Basin Project.)

Hank's name was pretty far down the list of those selected in the public drawing from the nearly 4,000 veterans who applied under the notice. His priority was not high enough for him to get one of the best units. Of the 160 acres in the unit the Tessitores selected, only 66 were classified as irrigable.

Nearly 4,000 veterans applied for land.

The Tessitores and their three small children, two girls and a boy, moved to the farm unit in 1956. Hank was 32 years old. In 1957 he obtained a loan from the Farmers Home Administration (FmHA) which allowed him to build a house and complete the development of the farm. Later, he served as a member of the FmHA County Committee.

Every year the Medina family comes from Texas to manage the crop.

In the early days, he and Alice grew, packed, and marketed onions from a 6-acre field. Other early crops included sugar beets, hay, and grain. And they have always had a few head of cattle.

In 1964 the Tessitores purchased 100 acres of public land adjoining their farm unit on the north. In 1966 they bought a privately owned farm unit adjoining their unit on the east. About this time they also leased two units retained by an original dryland pioneer in the area. The Tessitores currently own 246 irrigable acres; their leasehold totals an additional 160 acres. Such expansion over the years is typical of the good managers in the project area.

For the past 10 years Hank has been growing about 80 acres of asparagus. This has been the most stable crop in his rotation, which now includes sweet corn, carrots, sugar beets, and hay.

The asparagus crop is managed and operated by a Spanish-American family who come north each year from Texas, Mr. and Mrs. Enrique Medina and their 13 children. They have worked with Hank and Alice for the past 9 years.

Hank is now in his mid-fifties and trying to slow down. He says this year he will lease out about 75 percent of his land. However, he plans to keep at least some of his farm and retire on it. The Tessitores' three children have finished college, married, and found professions off the farm. However, Hank thinks there is a possibility that his son, an entomologist, may return to the farm.

In addition to the help he has received from his family and the Medinas, Hank has turned to the Bureau of Reclamation for help when he needed it. When the water level at his turnout fluctuated badly in the mid-60's, Reclamation relocated his turnout and installed overflow controls.

There were drainage problems, also, in a low portion of the base unit. After considerable study, this problem was corrected by the Bureau in two stages. In 1966 a deep, open drain was dug along the west boundary of Tessitores' unit and the adjoining unit to the south. Then in 1969 a deep sump was dug which intercepted a gravel layer underlying the unit, and pumps were installed to control the water table by pumping the seepage water into a nearby wasteway.

Hank and Alice are proud of their community. Most of their original neighbors are still living on their farms. They have all worked well together, trading equipment and helping each other as needed. Last year when a neighbor became seriously ill, others finished his farming and harvested his crops for him.

Square dancing is a major social activity for Hank, Alice, and their neighbors. Last winter, members of their local square dance group vacationed in Hawaii.

"The Basin has been good to us."

In reflecting upon the present farm situation, Hank wishes crops could reach the consumer with less markup. But he doesn't know how it can be accomplished. He realizes that his net worth has increased greatly over the years not only because of his management ability, but also because of the inflation in land values.

Hank concluded, "The Basin has been good to us." He gets no argument from Alice.

Enrique Medina, Jr., and Hank Tessitore discuss their asparagus crop.

Assistance for Many Lands

by Thomas A. Hughes

The water problems besetting the United States are a microcosm of those facing the world: uneven distribution in frequency and location, and water's susceptibility to pollution. To compound the problem, demands for water are constantly growing. Estimates indicate that as population doubles, the need for water triples. The world's population is expected to double by the year 2000, making the need for quality water staggering.

Will there be enough water to go around? "Yes," says Kent Bebb, Chief, Division of Foreign Activities for Reclamation, "if our present resources are properly managed and distributed."

The Bureau of Reclamation, as one of the world's most experienced water development organizations, is called upon frequently for technical assistance by nations throughout the world. The Bureau provides its expertise only at the request of the particular country, the Agency for International Development

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(AID), or by international organizations such as the World Bank. Since the Bureau does not compete with private consultants, the missions it fills are those passed over by the private sector.

The first foreign involvement by the Bureau was in 1921 when the Mexican Government asked for assistance in planning dams and irrigation systems. Reclamation sent engineers for approximately 3 years. Assignment of Federal employees to work in other countries was an informal program in the beginning. Engineers were released by Reclamation for employment by the Mexican Government. At about the same time, a rather large number of Mexican engineers came to this country for Bureau training.

As early as 1920, engineers from India, England, France, Egypt, Germany, the Philippines, Thailand, and South Africa visited the United States where they studied Reclamation procedures.

In 1945 and 1946 the Bureau assisted the Republic of China in designing the much-publicized Yangtze Gorge Project and provided training for a number of Chinese engineers.

The exchange of technical knowledge and information between foreign countries and the Bureau of Reclamation continued unofficially and informally into the late 1940's. It was still possible to handle these international matters within the existing structure of the organization.

However, three occurrences became the catalysts for Reclamation's foreign activities as we know them today: the enactment of the Smith-Mundt Act in 1948, President Truman's Point Four Program in 1950, and the establishment of special agencies within the United Nations. On March 30, 1951, the Bureau of Reclamation's Office of Foreign Activities was established.

Estimates indicate that as population doubles, the need for water triples.

For the past quarter century, the United States and the world community have placed increasing emphasis on the need to share technical know-how and help less-advanced nations develop their land and water resources. During this period, Reclamation has assisted 110 countries by providing extended periods of training to over 2,000 foreign nationals, and consultation and observation visits to more than 2,500 technical personnel for these countries. In addition, Bureau engineers and technicians have been sent to work on various projects in 62 countries.

Foreign activities personnel emphasize strongly that the Bureau only extends assistance upon invitation by a foreign country. The request comes through the Department of State and always on a fully reimbursable basis.

One of the major contributions Reclamation has made to foreign governments is that of "institution building"—that is, by helping governments to devise appropriate water and land development objectives, to establish standards and procedures, to prepare legislation, to design organizations to accomplish the objectives; and to prepare programs and to establish priorities for implementation.

A Malaysian ground crew resurveys the Klang Gates Reservoir.

If a government needs help in planning its water resources, it may request the Bureau's assistance on a fully reimbursable basis. Funds come from either the foreign government's treasury or from organizations such as AID. Reclamation is repaid for salaries, travel expenses, and leave time of the employees who are fulfilling the foreign assignment. However, the cost of trainees brought in from overseas is not completely reimbursable. There is a schedule of fees for the training but a small percentage of the cost is absorbed by the Bureau.

A vital part of the foreign assistance is counterpart training. Trained or partially trained people are assigned to the Bureau team when it arrives. They work side by side during the length of the Americans' stay. This ensures that when Reclamation employees leave, the counterpart personnel can carry on with the project.

The world community has placed increasing emphasis on sharing technical know-how.

In the past, developing nations have been overly anxious to program large-scale projects at the outset. Now, they are advised to produce a master plan for water resources development and to begin with one or two small pilot projects.

An example of the problems faced by many less developed countries is the Sao Francisco Basin Project in the Rio Branco region of Brazil. Several large structures were constructed in this isolated wilderness region. There were no roads to transport the produce from the irrigation project to market and neither the villages nor industry were advanced enough to use the electricity produced by hydroelectric plants. As a result, the project was of substantially less value that it could have been. The Bureau has found that feasibility studies and master planning are essential for completion of a successful project both in the United States and overseas.

Onion farmers of Costa Rica.

Bureau employees who serve on an overseas assignment are on their own much more than their counterparts in the States. Although there are some remote stations for Bureau personnel in this country, employees remain in contact, at least by telephone, with the regional office and all the expertise and assistance available there.

The selection of personnel for overseas assignments is extremely thorough. Stringent interviews are conducted before an assignment is given. Those selected must possess a certain amount of independence and confidence. They must be able to make decisions and follow through with them.

In addition to having technical capabilities, Bureau representatives must like people and be able to communicate with them.

They must not emerge as eager evangelists, with little or no sensitivity to local customs. If they do, they become the "ugly American" and a major purpose of the assignment is defeated.

The living conditions in these countries vary. The Bureau has always insisted that sanitation, health conditions, and other physical amenities are at least adequate. Reclamation has also insisted that its employees be given the same rights and privileges that nondiplomatic embassy personnel receive. The Department of State has always given the Bureau that assurance.

An ox-drawn cart hauls bamboo trunks to market in Nicaragua.

But some problems do arise. Recently, in Malaysia, a misunderstanding between two internal ministries placed Bureau personnel in what amounted to second-class status. Reclamation personnel were being charged road taxes, import duties on automobiles, and food and beverage taxes. Totaled, they were paying $1,400 to $1,600 per year in taxes that they were specifically exempt from, according to agreement. For the first time in many years, the Bureau issued a formal notice informing the Malaysian Government that since they were not following the terms of the agreement, the Bureau would be pulling out. The misunderstanding was quickly resolved and the people remained on the job.

The best possible medical services are available to overseas personnel, through an agreement between the State Department and Reclamation. In the event of a medical emergency, Bureau personnel notify the local Embassy's medical officer. This officer arranges evacuation to an appropriate facility, where the required services can be performed. For those stationed in Africa, the evacuee could be transported to South Africa or to West Germany. In the Far Pacific, the person could be given the best possible attention at American-staffed hospitals in the Philippines or at a military base within reasonable range.

Children of Bureau personnel overseas can attend elementary schools available to the embassy personnel. When students reach high-school age, facilities are more distant. In Saudi Arabia, for example, the nearest high school for Americans is hundreds of miles away. This means students must live away from home. Or they can attend school in the United States, in which case they are reimbursed for the cost. However, if they want to learn or already know the language, they may attend local schools.

In some areas of the world, the woman can become involved in her new community, working with the people and enjoying a learning experience along with the others. In some countries, however, such as Saudi Arabia, custom has it that the woman does little outside her home. For the active American woman,

the different customs can be a tremendous problem.

Most families provide their own entertainment while on overseas assignment. They travel extensively, visit the local beaches or, at some locations, enjoy a recreation center in the American compound. But recreation and entertainment, as most Americans know them, are not available in foreign countries. It is essential that the family be close-knit and can find enjoyment in just being together.

At present, Reclamation has 22 people on long-term assignments in 6 countries. Briefly, the present active foreign assignments are:

Zaire: The Bureau is providing technical advisory services in the construction of an extra-high voltage electric transmission line from the hydroelectric powerplant near the mouth of the Zaire River to the copper mining district in the southeastern part of the country. The transmission line will span 1700 kilometers through dense jungle and over rugged terrain. There are now nine Bureau technicians on the job.

Malaysia: An advisory team was established to aid the Drainage and Irrigation Department in connection with the Kuala Lumpur Flood Mitigation Project. The team will assist in a full economic feasibility study of the project, including raising Klang Gates Dam, improving the river channel, and diversion. Four Bureau people are on the job with two more to be added in the near future.

Nicaragua-Costa Rica: An appraisal study of the navigation and hydroelectric potential of the Lake Nicaragua-San Juan River system has been initiated. Four Bureau technicians are assigned to the study.

Saudi Arabia: The Bureau is participating in a joint Interior-Agriculture-Treasury Department technical assistance program dealing with water and agricultural development. Two employees are on duty there now.

United Arab Emirates: The Bureau is providing technical services to the State of Abu Dhabi in connection with its Water Supply Augmentation Project. A planning engineer, design engineer, and geologist have been assigned to the project.

In addition, the Bureau sent 31 technicians on short-term assignments to Senegal, Cape Verde Island, India, Yemen, Qatar, Saudi Arabia, and Nicaragua to advise on a wide variety of water development matters.

Our activities with the Soviet Union since 1973 have been under the 5-year U.S.-U.S.S.R. agreement for scientific and technical cooperation. The Bureau has played an important role in several areas. Recently, the most progressive group investigation has been in plastics, where the Bureau has done experimental work with plastics for canal linings and pipe, an area where the Soviets have been having some difficulty. The 5-year agreement expired in July 1977. There is some effort to extend this agreement for another 5-year term.

Since it began training foreign nationals in this country and providing technical assistance abroad, Reclamation has completed its foreign assignments in a manner that has contributed significantly to the United States foreign policy objectives and without impairment of its domestic program. Through these foreign activities, the Bureau has greatly enhanced its reputation worldwide as the foremost agency in water resources management and development.

The Inga II Powerplant in Zaire on the Lower Kinshasa River (Congo River).

A RECLAMATION RODMAN

by James H. White

The annals of water projects are filled with details of great engineers, ambitious politicians and civic leaders with vision. There are, however, few written accounts of the little people involved; the ones at the bottom who make the dreams and blueprints come true. Unfortunately, history takes little interest in these people and their special dreams, hardships, and frustrations. History must be somewhat exonerated, though, as diaries were seldom kept by the grassroots workers.

One such diary does exist, however. It was kept by

One such diary does exist.

a young bachelor who served a short but eventful tour of duty as a teamster and rodman* with the Reclamation Service of U.S. Geological Survey from 1902 to 1904 in western Colorado, eastern Utah, and southeastern New Mexico. This account does not shed any light on high level political or engineering decisions, but it brings to life the early days of Reclamation and serves to reiterate how great some of the early engineering feats were.

The diary was kept by Luther U. White, son of a Lutheran minister in Lincoln, Nebr. Luther traveled to Grand Junction, Colo., in 1900, at the age of 21, to bring his younger brother William west to recuperate from a suspected case of tuberculosis. Both boys expected to return home to enter the seminary as soon as Will was cured. Will died early in 1902, and Luther elected to stay in Colorado to seek his fortune.

James H. White is a Technical Publications Writer, Bureau of Reclamation, Western Colorado Projects Office, Grand Junction, Colo. Luther U. White was his father.

* A rodman is one who carries the leveling rod for a surveying team.

Luther White 1902

The diary, kept in a 4x7-inch red pocket notebook, begins with Luther's first day with the Survey. The entries that follow have been selected for their humor, their historical significance, or because they shed light on the conditions under which these men worked and lived. No further editing has been done.

The first entries were made while working on surveys that would lead to the construction of the Grand Valley Project in western Colorado.

—1902—

On the last day of September the writer left that civilized haunt of man, by name, Grand Junction, and that night unrolled his bed in a little tent by the roaring Plateau Creek. His only baggage was the mentioned bed and an A-1 two bushel grain sack. But the grain sack may be called by any number of names—trunk, valise, suitcase—but minus a suit, for writer has but one extra pair of trousers—or traveling bag, if you wish. But carry-all would be better, for it contains matter of numerous classes—toothbrush, comb, soap, the mentioned trousers, string, towel, thread, needles, pins and buttons, rivets, shoes, socks, letter paper, a few magazines and a razor and strap.

Oct. 13—Monday night finds me beside a cedar and grease-wood fire near tunnel station, some twenty miles up the Grand River [this reach of the Colorado River was called the Grand River at this point in history]. Two civil engineers are my company, nice agreeable men. This is an historical and romantic region. I am sitting in the old Salt Lake trail. When the railroad came it destroyed portions of the old road so that it is now no longer used. I doubt if a wagon has been in this vicinity for ten years. Tunnel [Station] derived its name from a railroad tunnel close by. A great canal may start here some day on its way bringing bounty to thousands of settlers on the desert below. . . The chief will raise my wages next month and take me to Arizona with him, so that I will have at least eight months of work at $45. I can pay my one debt and have $200 the first of June.

The Grand Valley Diversion Dam was completed in 1916 across the Colorado River about a quarter of a mile upstream from the mouth to Plateau Creek and about 2 miles downstream from Tunnel Station. The Government High Line Canal was completed in 1917.

October 30—Fell out of the back end of a wagon with Darie and nearly broke my neck. I lit upside-down backwards on my squash.

October 31—The party finished map as far as camp Clifton.

Nov. 4—H. J. Fisher, J. N. Kerr and myself break camp at Clifton and put up at Grand Hotel on our way to Montrose. We take a complete outfit.

At this time, the crew left the Grand Valley to work in the area that would later become part of the Uncompahgre Project.

Nov. 6—Weigh in clothes 149 pounds. Senator J. P. Bell who is here in the Smith Central house in Montrose tonight is reported elected. He seems to be a nice man. I am a little disappointed in Al Fellows, but my opinions are often a little wrong. He is a man of ability and generously hated by some grafters here.

Nov. 7—At camp tonight 15 miles below Montrose, 5 from Olathe. The coyotes are out in full chorus tonight.

Luther White's survey party camped about a quarter mile from this site, where the Grand Valley Diversion Dam was later constructed in 1912.

Nov. 13—Moved camp to Kellys and visited Olathe, three general Merchandise stores. Had a supper cooked by a woman—good.

Nov. 17—Broke two inches of ice to get water to wash this morning. "Learn to labor and to wait."

Nov. 21—Tonight Kerr dressed up with the aid of a pair of my $1.50 trousers and went to a dance at "Four Mile" school house. If I could dance I should have gone along. It is the only amusement in this almost wild country. When the music stops they will unconsciously hear the yelp of the coyote. I hear them pow-wowing right now.

Nov. 23—Sunday. This is the first time I can remember of going supperless to bed in my life. We had a late dinner and the madam evidently thinks that will suffice. We have ram, lamb, sheep and mutton at this place, shoulder of mutton, roast ribs, ribs boiled, ribs fried and ribs dried, not to mention leg of mutton, (away down below the knee). Think of a fellow who never eats mutton having it set before him three times a day—when he is fortunate enough to have that many meals set before him.

Nov. 27—Thanksgiving—I have some things to be thankful for—health—plenty of good hard work—in two days I will have enough money to pay my debts and $13 to the clear. Two things I am going to endeavor before Xmas—to keep my temper and my tongue—If I talked less people would not guess what a fool I am and maybe give me credit for being a man of judgment. This has been a very quiet Thanksgiving—no church—no turkey—no skating—no football game, nihil.

December 15—Today ends ten weeks with the survey. We are wading in ten inches of snow and the weather is very cold morning and evening. I was forced to resort to the snow method to recover circulation in one of my feet tonight.

Dec. 20—Still the snow and cold. The thermometer has been registering very low this week—20 degrees below one night. It is at least 5 degrees below now. My feet have been wet all day and I have a pair of very sore lungs.

Dec. 22—Kerr left for Needles, California, today and Louis Foster of Edwards camp took his place at the plane table. Kerr is one of the finest young men I have met. I learn that my name with that of two others has been sent in for permanent employment. I am afraid that work will close up here soon.

Xmas—Awakened at eight this morning by Kelly's "whoo-o-e-e" drawn out and melodious. Breakfast at nine. This was a beautiful day. Took a little hunt until dinner at two. After that elaborate meal I went to Olathe for the mail.

—1903—

Jan. 4—Sunday at Kelly's. I think Kelly has used up my oats. He is undoubtedly a grafter.

Jan. 11—Came down with Sands to Excelsior divide this evening. It has just been discovered that the valley over in Utah across the divide is higher than this side by some 200 feet.

Jan. 17—I have been acting as assistant teamster and roust about this week. Yesterday I crossed the Excelsior divide. The valley in Utah is very pretty from an agriculturalists point of view. The talk in this camp is certainly very rotten. I never heard anything much worse.

Jan. 23—Started to move to Westwater today. Are camped on the divide.

Westwater is a rugged canyon area on the Colorado River just west of the Colorado-Utah State line. Reclamation has conducted several investigations there but nothing came of them.

Jan. 24—We reached camp at the mouth of the canon today. Hustle up tents and hay late at night.

Jan. 28—Worst sand storm ever witnessed. We are literally buried in sand.

Jan. 30—Did assistants work for Sands on dam sight. Darie gets a tip today that he and Luhrs and myself will be chosen to go with the party to Ouray. The cook is sick today which means that he will quit tomorrow.

Jan. 31—Cook quit according to prediction.

Feb. 6—Out in snow and cold until nine o'clock. Moved Boustedt down to low dam sight. The snow and roads or no roads made the ten mile drive down consume 5 hours. This is a very cold evening. Matthes has found two very good dam sights, the lowest one being exceptionally good.

Feb. 11—We broke camp at Westwater today and started for Fruita, the snow is 6 inches deep.

Feb. 12—The snow is over a foot deep today. We moved from the divide to Keifer's ranch. Snow fell all day. The weather is bitter cold. The chief went snow blind. We lost the road many times.

Feb. 13—Whole force went down to the old camp at the divide to get the water tank left there. Here is a sample of management. Cold, very deep snow. Two engineers and four men spend two days to move a tank value $10 or less, cost of moving $75.

Feb. 15—Moved to camp on Grand River below city. We are all heartily glad to be in town once more. The trip to Westwater and return has been a terror. 30 degrees below is about what it was at Keifer's one morning. Luhrs has a couple of boils on his neck and we are all more or less frozen in disposition.

March 1—Sunday spent at the Smith Central house in Montrose. From a week ago Saturday noon until Thursday I had nothing much to do and spent the time doing just exactly as I pleased. Thursday the trip with a big load and very bad roads commenced. Mr. Matthes accompanied me to drive the little team. Mr. Fellows left Denver yesterday for Washington. In a letter to Mr. Matthes he says he will be glad to employ me this summer. Whether the work will continue or not depends upon this visit. I expect to go to our camp at Dominguez tomorrow.

Dominguez was a railroad station in the Dominguez Canon (canyon) on the Gunnison River between Grand Junction and Delta, Colo. The Bureau of Reclamation is currently conducting feasibility investigations on a multipurpose project in that canyon.

March 10—We started to move to Montrose today. We are in the mud away up on the Mesa, 7 miles north of town. Snow fell to the depth of 6 inches Friday night and has all melted since Sunday. We will sleep out in the mud tonight. The rancher where we are stopping has nothing more valuable than the grumps.

April 10—Yesterday Charles, Torrence and I worked in the dobies* over by the state tunnel. The rain drove us in. Today Sands run down the track toward Olathe. The wind drove us in today. Charles started for Denver today. Sands took a "tart" to Delta to a dance tonight. Forty-four miles round trip.

April 22—Finished level line from the tunnel to Fairview Siding yesterday and are working up the Ouray branch of R.R. A young fellow in town was appointed guager today. He evidently has a graft. It makes the rest of us fellows who have worked hard sore to see the snaps go thusly.

May 6—Foster, Terrence, Heald and myself came up to Jones' cabin in Jones' gulch through Bostwick park and Bostwick gulch, on Monday. We are running levels from the R.R. to Jones' Summit. The weather is splendid and everything is lovely except the ticks. They are stayers.

May 10—Went into the Grand Canon of the Gunnison. It is wonderful, vertical walls a half mile high, roaring rapids and falls, flowers, ferns, and mosses. Charlie Heald was coming down a rock slide behind me and started a stone. The stone passed so close to me that it removed the seat of my trousers.

* "Dobies" is derived from the word "Adobe". Dobies refer to badlands—those with poor, clay soil and rough, deep gullies.

An unplanned detour on the Grand Valley Project, Colo.

May 11—Cut sagebrush out road to the canon.

May 22—The weather the past week has been simply "awful." Sunday 8 inches of snow fell here and the ticks have been plentiful. . . The high moguls sprung a game on me, but evidently thought better of it. They proposed putting me in charge of the trail building.

May 30—Decoration Day—Have been pretty sick yesterday and today. Thursday afternoon I went with Foster down to the dam sight. It was a very hard and tiresome trip. We were in a place where it is safe to say no other men had ever been before. One misstep or slip would have meant instant death. Foster has picked on me to rod this topography. It is a very dangerous piece of work and will require all my nerve.

June 30—Foster and I are running levels down into the canon. We expect to be through by the "Fourth." The world runs as usual.

July 8—Foster and I went down over 200 feet of rope to the Dam site.

July 13—Taking topography with Sargent at the dam site. He is a surly mean brute of a grafter. Knows less about topography than I do. Check came.

July 26—Working with Foster again down on H line in the dobies. Foster was struck by lightning yesterday. He was crazy for a little while.

August 30—We have finished work on level lines in dobies and I am glad. Monday and Tuesday this week we run a short level line in Shavenaugh Valley. The rest of the week was spent as Torrence's assistant. My salary increased to $50 this month.

Sept. 7—Montrose again. Played at ball. Bebbs' camp won over the rest of the survey. A flood came down from the hills last night and nearly washed our camp away. My bed is almost ruined with mud. I will probably remain as Torrences' assistant at plane-table.

Sept. 27—Still plane table assistant with Torrence. Finished sheet in dobies Friday and moved down to town Saturday. We move to Frosts tomorrow.

Sept. 30—Camped at Frosts siding, 7 miles from Montrose. Yesterday and today I ran my first levels. My first line didn't tie up very well.

October 18—Sunday. Torrence, Auterson, the cook and myself are in camp. I did a good sized washing this morning, cleaned my tent and took a bath in the Uncompahgre (River). Melted snow makes very cold water. Our sheet is completed and we move Wednesday. Torrence is making a record on topography. I am not, though. Make too many errors.

Nov. 14—This week I went to Montrose the first time in six weeks. We are camped down near Peach Valley. We will commence details on our sheet on the 16th. Ran some more levels today. Weight 152 pounds. Checks came today.

Nov. 21—Cold disagreeable weather.

Thanksgiving—Went to town—Delta—today and took dinner at the other camp. I have a kind of lonesome spell today.

The distribution system of the Uncompahgre Project was constructed between 1904 and 1912 and is one of the oldest Reclamation projects. The key feature of this project is the 5.8-mile-long Gunnison Tunnel which conveys water from the Gunnison River in the Black Canyon to the Uncompahgre River Valley for irrigation of some 67,000 acres surrounding the towns of Montrose, Delta, and Olathe. The tunnel was completed in 1909 and in 1972 it became the 26th structure to be acclaimed as a National Historic Civil Engineering landmark by the American Society of Civil Engineers.

Dec. 13—Last Monday we left camp in Peach Valley. Friday we left Montrose for Roswell, N.M. where we are tonight. Roberts, Torrence, Chapin, Washburn, Henderson and myself. Roswell seems to be a nice town of probably 5000. Amarilla where we stopped this morning is on the boom with 6500.

It is not clear just what the purpose of the work in New Mexico was. The diary was neglected during this period and a lot of questions are unanswered.

Xmas—1903—We reached Roswell Sunday evening the 13th and put up at the Grand Central Hotel. This is the highest price house I ever lived in. The service is hardly in proportion. After a weeks delay on account of tents we started for a camp in a regular New Mexican sand storm. Two nights the party slept out on the ground. Watering places are twenty to 25 miles apart. Monday evening we pitched camp 50 miles from Roswell, the nearest town. All my mail and Xmas presents are down there. Our camp is in a draw at the old Hernandez ranch. This is a beautiful day and it is hard to realize that this is Xmas. This is the fourth one I have spent away from home. We have nothing to do today but wash clothes and clean up. We commenced work here on the 23rd.

—*1904*—

Jan. 9—I witnessed a regular N.M. sand storm. It is truly fierce.

Jan. 10—Cleaned up after the storm.

Jan. 11—Another storm. This is a poorly regulated camp. The big details are all very well, but in little things Mr. Patterson is very little. We have had no fresh meat and beef is very handy and cheap. Our lunches consist of dry bread and canned meat or fat pork with mince pie, a very indigestible sort of mixture. Tom kicked for more, and he said, "Yes if your men need fruit to enable them to do more work they can have it." We have no lamp and cannot read at night. The chief has a big round burner lamp though. Our standing desire is that "Mother had all her children home." At night we sing,—"Carry me back to Old Virginia," and "I'm going to live anyhow until I die."

March 28—In camp along spring river. We reached town again on the 25th an absence of over three months. Of all the time out the last two weeks have been the worst. A rotten chief, a poor cook, long drives, wind, and the very poorest water I ever drank. We used water out of a hole with 3000 sheep that had been standing for 10 months. We are helping the party on the Hondo to finish up. They have been doing 40 sq. miles while we have been doing 80. Torrence is the fastest topographer in the service.

April 16—Amarillo, Texas, 10 PM. Darie H. and I started for Montrose this morning. The government furnishes us traveling expenses back to Montrose. We experience the inconvenience of traveling north or south in this country. It is going to take us a little over 50 hours to go a little over a thousand miles. We were sorry to leave Torrence and Washburn, but they go to Los Vegas until July. This whole arrangement was best for all.

April 18—Back at Montrose. Am going with D [Darie] to G.J. [Grand Junction] for a couple of weeks layoff.

One man named frequently in the foregoing paragraphs. Darie Henderson, remained a life-long friend of Luther's. Darie stayed on with the Survey and Reclamation until the Grand Valley Project was completed. He then went to work for the Grand Valley Water Users Association, from which he retired in 1949. Luther did not maintain contact with any of the others, as far as is known today.

May 5–Camp No. 1–Cedar Creek–Darie and I came up from Grand Junction on the third. Our trunks did not arrive until today. We have been in rain and mud all week. My state of mind was never worse in my whole life. I am rodman for hand level topography. I am decidedly sick of this whole business, but cannot quit just now.

June 2–I have been lax in the matter of my diary and must make it up. On May 19 I was fired, body, soul, and breeches. The fault was not mine. I have often wondered whether I had real spunk or not. I have the real Sonnedecker variety. [Sonnedecker was his mother's maiden name.] No job carries the right to bully me.

The details of the termination of Luther's Government service are not presented in the diary, but he gave the following version to his family. When he went to New Mexico the previous December, he left a coal-oil lamp in the Montrose camp. Upon his return in May he found that the cook had laid claim to the lamp. This led to a dandy fist fight. The party chief decided rodmen were easier to find than cooks so Luther was fired. It is evident from the diary that Luther's state of mind had been deteriorating steadily during the last few months, so it is quite possible that an end to this kind of life, for him, was inevitable.

Luther continued to live in Grand Junction until 1917. In that year he moved to Meeker, Colo., where he started a nursery and floral business. He continued to operate this business until 1958. He was married twice and raised five children. During his long and active life in Meeker, he was a leader in civic and community affairs. He served several terms as mayor and was active in the Methodist Church, Lions Club, and the Democratic Party. He died in Meeker in 1963 at the age of 84.

In spite of the involuntary nature of his termination with the Service, Luther was always very proud of his involvement with the beginning of Reclamation. He was a strong proponent of water development, and deeply concerned about the need for more water development if western Colorado was ever to reach its full agricultural and industrial potential.

Main Street of Grand Junction, Colo., 20 years before Luther White visited.

"As a supermarket owner and operator and as a banker, I learned of the great need and benefits derived from a project such as the Weber Basin Project. The number one thing . . . [is] the fact that this is not a 'pork barrel' situation. Our board of directors (from five counties in Utah) all feel the same way. On March 1, 1977, our payment to the Government totaled $950,012 . . . a yearly payment . . . on a debt of $81,656,000. The project is repaying about 85 percent of the cost, and any objective person would certainly agree that the flood control, recreation, fish and wildlife, stream-flow maintenance provided the public is worth the 15 percent [difference]."

—Wayne N. Winegar, Manager Weber Basin Water Conservancy District

HOW WE SEE RECLAMATION: Local People Speak

"The building of Mountain Park Dam was the only hope for a much needed municipal and industrial water supply for the cities of Altus, Frederick, and Snyder, Okla. We Oklahomans take pride in what we own, and we aren't too quick about slapping a mortgage on our property or voting a tax on ourselves. Yet, in a special election the citizens . . . recently flocked to the polls and voted a 5-mill ad valorem levy to be imposed should there be a failure in the repayment schedule. We are going to make it! Its our dam and we are proud of it!"

—Hoyt Shadid, District Manager Mountain Park Master Conservancy District, Altus, Okla.

"Here on the west side of the arid but rich-soiled Sacramento Valley, the 120-mile-long Tehama-Colusa Irrigation Canal . . . is fast nearing completion. More than a quarter century ago, as steadily rising taxes made it increasingly unprofitable to grow dry-farmed crops on limited family acreages, foresighted farmers began calling for an irrigation program. It entailed diverting water from Reclamation's multipurpose Shasta Dam. Regional news media jumped into the campaign. [Congressmen responded] as elected representatives should to grassroots needs, corresponding to the national interest. Delegations of anxious farmers, at times more than 20 in number, [flew] into Washington annually to press for canal construction funds. More than 23 years elapsed . . . until last year, happily, water was first released onto some 10,000 parched acres."

—Edwin F. Davis, editor, The Willows Daily Journal (California)

"When settlers first moved to the valley there was not a dependable source of water. The river either flooded or dried up. But then the Salt River Project was built. We worked hard to get [the project] and to make it work. And it has."

—Olive E. Linder, Phoenix, Ariz.

"Our early ancestors, who first settled the West, put forth noble efforts to tame the mighty forces, [of nature] but their resources were inadequate. It was the development of Reclamation that made most of it possible. This has been a very successful arm of the Federal Government. The real value of government lies in its ability to help the people do that which they are unable to do for themselves."

—C. L. Gould, Manager Wellton-Mohawk Irrigation and Drainage District, Wellton, Ariz.

"In my 32 years of irrigation work, I have had many occasions to work with [Reclamation] personnel and to observe the development of new projects or the rehabilitation of old projects throughout the Western United States. I have observed one basic policy. All of these projects were initiated at home, fought and paid for by the local people. [Projects are] paid for by local property owners. [Projects] also create a larger tax base, such as hospitals, schools, processing plants . . . plus various sorts of fringe benefits for recreation, fishing, boating, flood control, etc."

—Elmer G. McDaniels, Manager A & B Irrigation District, Rupert, Idaho

"The Reclamation program made possible a dependable water supply to our 11 member cities, and the costs will be repaid to the Federal Treasury with interest. All this was accomplished with maximum local control . . . with operation and maintenance of project facilities by our own organization. This is a perfect example of the benefits available through workable Federal programs when local interests are not able to help themselves."

—John C. Williams, General Manager, Canadian River Municipal Water Authority, Sanford, Tex.

HYDROELECTRIC POWER-ENERGY FOR THE WEST

by William E. Warne

Hydroelectric power, Reclamation's byproduct, has grown to influence the lives of almost all persons living in the arid West. Both through supporting irrigation and providing hydroelectric energy, the power partner has improved the western economy almost from the start of the Federal Reclamation program.

Hydropower was not completely overlooked by those advocates of Reclamation who finally won the victory on June 17, 1902, when President Theodore Roosevelt signed the Federal Reclamation Act. The watchword was irrigation to make new farms and homes in the deserts, but A. P. Davis (second Director of Reclamation, 1917-23) had foreseen the role that power might play. He pointed out the power opportunities that would accompany irrigation in reports made while the legislation was pending.

William E. Warne, author of *The Bureau of Reclamation*, served 12 years with Reclamation (4 of them as Assistant Commissioner), 4 years as Assistant Secretary for Water & Power, and 8 years in various official capacities in Iran, Brazil, and Korea.

The challenge of reclaiming the deserts of the 11 Western States crowded out other issues when the hearings were held on the Newlands Bill. In 1906, however, the first of a long series of amendments relating to the power partner was added to the Federal Reclamation law; this was the public preference provision.

It would have been too much to expect even the men of vision who founded Reclamation to foresee the role of hydroelectric power in the Federal program today, 75 years later. For example, the atom bomb was unimaginable in 1902, yet 40 years later the new Grand Coulee Dam powerplant secretly was pressed into service on a war-time emergency basis to supply the energy for Mystery Project X at Hanford, Wash. One of the two bombs that ended World War II was manufactured there. The new generators helped usher in the nuclear age.

In 1902, only a few more than 100,000 people lived in Los Angeles, Calif., which at that time was just beginning to outgrow the local water supply obtained from the Los Angeles River. Today 2.8 million people make Los Angeles the third largest city in the United States; 11 million people reside in the Los Angeles metropolitan area.

The damming of the Colorado River and the distribution of the waters of that stream have supported the development of southern California. The influence of the power generated at Hoover Dam, at Davis Dam, and at Parker Dam was perhaps as great. The power has sparked the industrial growth and economic development of that area during the past 40 years. In addition, hydropower helped pump the water through the life-sustaining aqueducts.

One does not need to rank the purposes of Reclamation in order of importance nor to make comparisons to justify any of them. The contributions of each project have been woven into the economy of the West and each helps in its way to form the pattern of life throughout the arid region.

Hydroelectric power has grown to influence the lives of almost all persons in the West.

In the most recent year of operation for which records are complete, 1975, the 50 powerplants on Reclamation projects generated 56 billion kilowatt-hours of electric energy, and returned $247 million to the United States Treasury. Westward to the

Pacific Ocean, from Minnesota, South Dakota, Nebraska, Kansas, and New Mexico, almost every house, farm, office, store, and factory is connected to one electrical system or another which gets part, and in some instances, all of its power supply from one of the generators operated by the Bureau of Reclamation or by a water user organization.

When the Pick-Sloan Plan for the development of the Missouri River Basin was adopted in 1944, it was determined that fewer than 10 percent of the farms in North Dakota had electricity. Today, virtually every farm in the State—and in the whole Missouri River Basin—has electricity as a result of Reclamation's programs. Though the Missouri River dams were built by the Corps of Engineers, the Bureau of Reclamation markets the power under the Pick-Sloan Plan.

Perhaps one would have to live through a transition such as that which occurred in North Dakota (and in other States of the basin) to appreciate fully the improvement that rural electrification has made in people's lives.

I remember what life was like without electricity in Imperial Valley, Calif. Until I left the ranch and went to the University of California just before my 18th birthday, I did all of my school homework by the light of a coal oil lamp on the kitchen table. All of the cows on my father's dairy farm were milked by hand, though electric-powered milking machines were in common use in other rural areas of California. My mother cooked on a wood or coal oil stove, depending on the season. (The wood stove was too hot in the summer.)

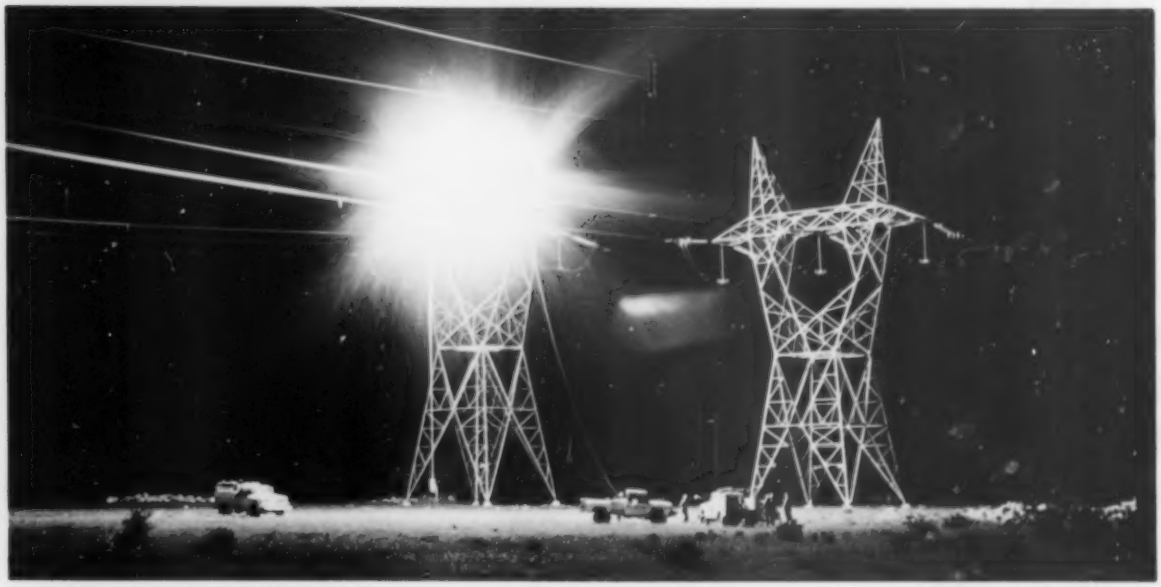
Hydroelectric power generated at Reclamation dams travels thousands of miles of transmission lines.

Since we had no pumps to lift water, there was no indoor plumbing. We used only hand tools such as grinders, saws, feed-mixers, and cream separators. We had a hand-wound gramaphone; there were no electric clocks, radios, shavers,

We had a hand-wound gramaphone.

or water heaters in our ranchhouse. The incubators were oil heated. Even so, we thought we were fortunate in the Imperial Valley, because the winters were not rigorous, and my brothers and I could live out-of-doors and swim in the irrigation ditches most of the time. In North Dakota the winters were long and icy and the penalties of deprivation were much more severe.

After I had gone away to school. the Imperial Irrigation District provided electricity to



the Imperial Valley, using power generated at the drops in the All-American Canal. That occurred, however, several years before the authorization of the Pick-Sloan Plan.

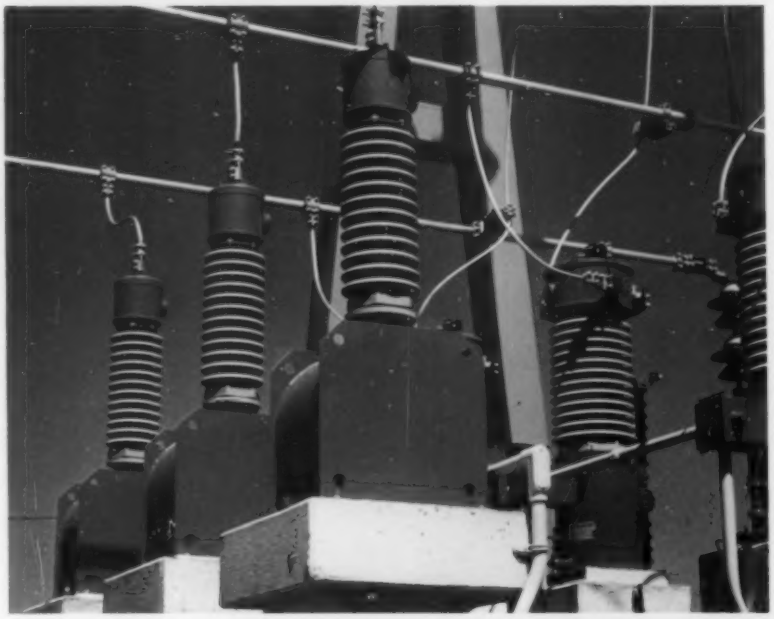
Today, most farms in the West enjoy all of the amenities that are brought to urban homes through the use of electricity. Power generated on Reclamation projects has played the major role in the modernization of rural western America. The Rural Electrification Administration (REA) was the primary distributor. But the availability of Federal power was the key element in the extension of electric programs into the rural West.

The Bureau of Reclamation has either built or sponsored programs that have resulted in others building great, interconnected electric transmission systems that now constitute a backbone network covering the Western United States.

Hydroelectric power once was looked upon as a byproduct of irrigation development—the waters held in a reservoir could turn turbines as they were released into irrigation canals. Originally, power generation had a low priority. The decisions on early Reclamation projects regarding capacities of structures and operation schedules were governed by the most efficient irrigation regiment. The only guideline for the use of hydropower was that it should not be wasted.

When the multipurpose concept became prevalent with the advent of large dams, power was recognized as a valuable paying partner of irrigation. Upon completion of Hoover Dam in 1936,

This transformer at Pleasant Valley, Calif., steps up and steps down voltage.



revenues from the lease of falling waters to produce energy were estimated to return virtually the entire cost of the dam in 50 years. Even the $25 million allocated to flood control would be repaid by power revenues, although the repayment would be delayed. The irrigators and other water users who were dependent upon the waters of Lake Mead were immensely benefited, because they only had to pay 25 cents an acre-foot for the stored water released to them.

Some of the water users, such as the Metropolitan Water District of Southern California, were doubly benefited because they were also allocated energy from the powerplant to operate the pumps used to divert Colorado River water to the California Coastal Plain.

A secondary benefit for all water users was the growth of the economy, stimulated by the introduction of the low-cost energy supply at Hoover Dam.

Revenues were estimated to return virtually the entire cost of the dam in 50 years.

But this benefit extended to all residents of southern California.

The ripple effect of economic development carries the influence of such projects as Hoover Dam much beyond their service areas, even beyond the boundaries of the regions that they primarily serve. The gross national product is increased because of the dams and more income taxes flow into the Federal Treasury because of the

development stimulated by the supply of energy and water.

The socio-economic impacts of the great Reclamation power dams have been pervasive and significant. Dams like Hoover, Grand Coulee, Shasta, and Glen Canyon have been hailed as great works of the American civilization. Just as some of the results of these dams could not have been foreseen in 1902, neither were the influences of power predictable. Both the policy and the engineering skills of Reclamation have evolved in the 75 years of its history. Equally as dynamic is the place of the large hydroelectric powerplant.

In early years, the hydroelectric generators were sized and operated to meet base-load requirements of the utility system they served. Peaking power, it was believed in those times, could be obtained from other sources more cheaply than it could be obtained by adding generators that would operate only in periods of high waterflows in the hydroproject.

As the electrical industry developed and fossil fuels became more expensive, it became evident that hydroprojects had a great advantage as peaking facilities because of their flexibility. As a result, new powerplants have been added to existing facilities. For example, new powerplants have been added at Grand Coulee Dam, not because there is any more water in the Columbia River than there was in the 1940's when the initial generators were installed, but because the floodwaters that were deliberately spilled over the crest of the dam when only baseloads were met can now provide peaking power.

The hydroelectric program of the Bureau of Reclamation has never been static, but has grown and developed in keeping with the changing needs of the people and the economy of the West.

After 75 years, the multipurpose project concept is firmly embedded in national policy. It not only decrees that uses such as irrigation, power, and flood control be considered, and in their planning the benefits from them be optimized, but it also recognizes fish and wildlife conservation, recreational uses, and aesthetic and environmental enchancement as elements of water resource developments.

Since the Arab Oil Embargo of 1973, which made us realize that energy demands are overreaching energy supplies and some fuels are being exhausted, a further consideration of the relationship of water and power development in the West seems to be emerging. Water, a renewable resource, can provide a clean supply of energy—almost indefinitely.

In the multipurpose project, water and power support each other in a single development. They are interdependent. Water needed in the oil shale fields of Utah or Colorado in the Upper Colorado River Basin must be withdrawn from a stream which is already fully committed to beneficial uses. Energy needed to desalt the Wellton-Mohawk Project drain, so the return flow into the Colorado River can be reused in Mexico, must be withdrawn from the electrical systems that already are scrambling to meet existing demands. Water and power planners must take into account the interaction between the two resources.

In the future, projects will include more than joint uses of water, as at Hoover Dam for electricity generation, for conservation, and for storage. Such projects in the future may be required to integrate uses of several resources, such as a plant to extract oil from shale in which a part of the energy generated would be used to desalt water downstream in the Colorado River.

The project might not generate water, but it would make the water supply reusable, which would have a similar result. Likewise, a water development project may have to include the powerplants needed to operate pumps, to desalt wastewaters and irrigation return flows, and, most specifically, to cool the generators and supply water for fuel extraction.

We have seen the guiding policy of Reclamation evolve in 75 years from a simple idea to a complex concept. We have witnessed the development of hydroelectric power. Today it plays a significant role in the daily life of everyone who lives in the arid West.

Reclamation now has a history of achievement on which to build. The energy and water problems of the West have not been resolved, nor will they ever be, but over the past 75 years Reclamation has played an important role in hydroelectric development.

Reclamation's Concern for Fish and Wildlife

by Carol Prochaska

Although fish and wildlife enhancement were not included in the planning and design of early projects, they are now basic considerations in all Reclamation projects. Features and programs designed to enhance fish and wildlife are many and varied.

One of Reclamation's latest innovations to improve fishing in the West is the creation of artificial spawning beds for fall chinook salmon on the Tehama-Colusa Canal in California. The 3.2-mile canal just below Red Bluff Diversion Dam on the Sacramento River is both a salmon nursery and a conveyance channel for irrigation water. Some of the salmon headed for the upper reaches of the river to spawn are guided into this canal section to lay their eggs. The waterway offers almost ideal conditions for spawning—carefully selected gravel and water of the proper temperature flowing at controlled velocity and having an unimpaired naturally high oxygen content. As the hatched fry explore the world outside their graveled sanctuary, they are swept gently downstream to begin their journey to the sea. Four years later they will make their way back up the river to spawn and the cycle will be repeated again.

About 25 percent of Reclamation expenditures in the Lower Colorado River area is used to meet the requirements of the dozen or more Federal, State, and county recreation areas and wildlife refuges located along the river below Lake Mead. Silt has been a long-standing problem related to both water supply and to the environment. To reduce the amount of sediment transported, selected stretches of the river are dredged. Growth of phreatophytes along the banks is controlled, but sufficient cover is left to provide wildlife habitat.

In 1975, construction on two projects with significant environmental enhancement features was completed. Operation of the Marble Bluffs Dam and the Pyramid Lake Fishway, located on the Truckee River northeast of Reno, Nev., provides for passage of spawning fish around the river delta. In recent years the delta has blocked almost all upstream fish migration.

planted in a 20-acre burned area adjacent to Lake Berryessa in California to stabilize the soil and restore the scenic quality of the shoreline, also provide nesting sites and food for birds and small animals.

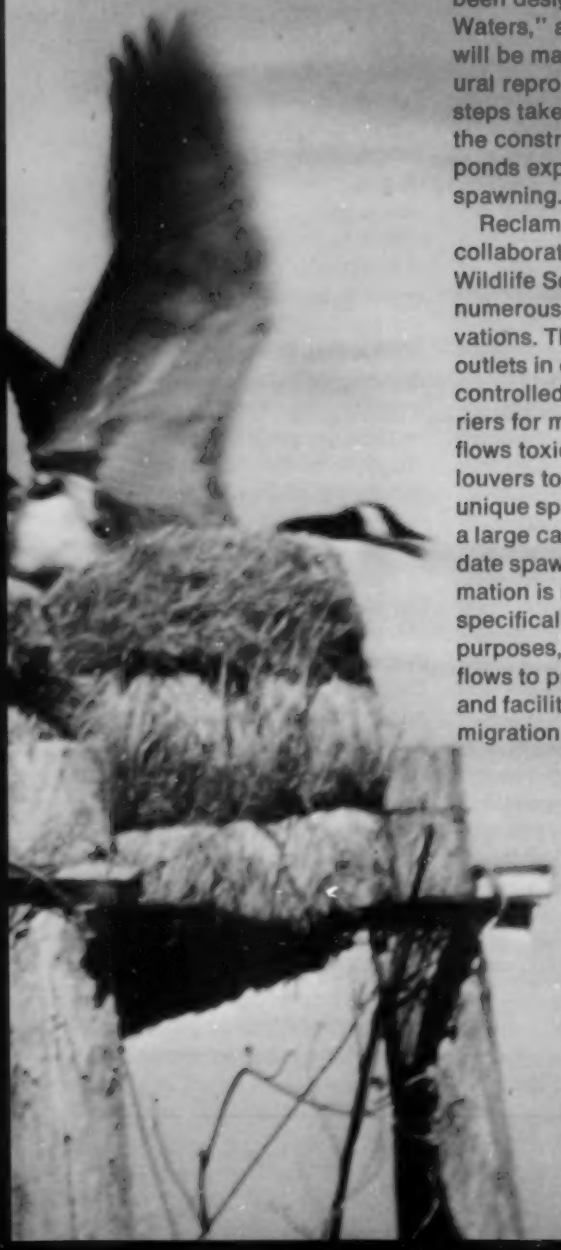
The initial phase of the Garrison Diversion Unit in North Dakota provides for the acquisition and development of 147,000 acres of land for fish and wildlife purposes. This area is on the Nation's most heavily used waterfowl flyway.

The Granite Reef Aqueduct Flood Detention Dike on the Central Arizona Project was designed with a meandering centerline to preserve patches of existing vegetation at intervals along the length of the canal. In place of smooth finished grading, the dikes were left with a rough finish to facilitate revegetation. Natural vegetation, salvaged during construction, was replanted on the dike. Trees,

Carol Prochaska is the Project Public Affairs Officer for the Columbia Basin Project, Bureau of Reclamation, Ephrata, Wash.

Quality trout fishing streams have been developed in recent years below Flaming Gorge, Glen Canyon, and Yellowtail Dams. Previously, these stretches of the three streams were largely unproductive as fisheries.

The Fryingpan River below Ruedi Dam on the Fryingpan-Arkansas Project in the Lower Missouri Region has a regulated streamflow. Enriched water released from the reservoir has benefited the trout fishery by providing cooler summer flows and a more abundant food supply. According to a study conducted by the Colorado Division of Wildlife, a 14-mile reach of the river immediately below Ruedi Dam is one of the most productive in the State. It has been designated "Wild Trout Waters," and trout populations will be maintained through natural reproduction. Among the steps taken to further this use is the construction of siltation ponds exposing gravel beds for spawning.



Reclamation engineers have collaborated with the Fish and Wildlife Service in designing numerous fishery habitat innovations. These include multilevel outlets in dams for temperature controlled fishery releases, barriers for mine drainage and salt flows toxic to fish, directional louvers to guide fish, and a unique spawning bed cleaner for a large canal that will accommodate spawning of salmon. Reclamation is now acquiring lands specifically for fish and wildlife purposes, and regulating streamflows to protect waterfowl nests and facilitate spawning and migration of fish.

During the past 6 decades, 17 currently operating national wildlife refuges with a grand total of 242,000 acres have been established on Reclamation and acquired lands. Big and little animals, birds, and fishes live, rest, or feed on these lands which are set aside and managed with their special needs in mind. On the refuges and elsewhere on Reclamation projects, man has the opportunity to see and enjoy nature's other creatures in natural, protected settings.

A dust abatement program along the 25-mile-long Canyon Ferry Reservoir in Montana is turning a barren, dusty eyesore into an ideal habitat for water-loving wildlife. With the rise and fall of water in the reservoir, which is located on the Missouri River near Helena, all vegetation had disappeared from the beaches and the soil mantle had broken into extremely fine-grained dust. Occasionally, geese would attempt to nest near the water's edge, but their nests were often destroyed as the water level rose in the reservoir. For several months each year, the area is swept by high winds. The blowing dust created a health and economic problem for residents of the area.

In 1972 a plan was adopted and work started which include construction of a four-dike system, totaling nearly 10 miles. It will enclose almost 1,900 acres of the upper end of the reservoir. The dikes make it possible to maintain a more stable water level, provide a permanent solution to the dust problem, and at the same time permit a favorable wildlife habitat to develop.

In the design and construction of the diking system, features were included that permit good waterfowl management practices to be carried out.

In developing the plan, Reclamation engineers worked closely with the Montana Fish and Game Department which manages the area for fish and wildlife purposes.

To allow interspersion of vegetation and open water that would provide suitable habitat for a great variety of birds and other wildlife, dredged material is placed at different contours and depths. The Missouri River provides a permanent water supply for the impoundments, and each dike is equipped with control structures so that water levels can be regulated for the propagation of aquatic plants.

Also, a number of small islands were established behind the dikes to provide nesting sites for Canada geese, ducks, and other water birds. Planting of grasses, spike rushes, and other vegetation helped quickly to stabilize the soil against wave action. In addition, aquatic plants already in the area have spread and colonized the new ponds naturally.

Waterfowl and other wildlife quickly took advantage of the changes. Before the first pond was completed, wildlife use of the area had increased dramatically. During the spring of 1974, thousands of pintail ducks paused to feed as they winged northward on their annual migration. All of the nesting islands were occupied by Canada geese. Over 200 goslings were produced in 1975, where a few years before only a few dozen had hatched. Herons were seen feeding in the shallows, and swans rested along the shores.

Although the project will not be completed until 1980, as work progresses and more ponds are formed, wildlife use continues to increase. Small mammals and nonmigratory birds have taken up residence and a busy, productive community has developed.

Within the shadow of Hoover Dam, rare desert pupfish are thriving and multiplying. There are less than 300 of the species in the entire world, and when a declining water table threatened those living at Devil's Hole in a detached part of the Death Valley National Monument, the Bureau of Reclamation agreed to assist in a rescue operation. Through an agreement with the Nevada Department of Fish and Game and the Fish and Wildlife Service, a refugium was built by the Bureau in 1972. It is fed by one of the warm springs flowing out of a sheer cliff into a ravine in Black Canyon. The new pond has a shallow shelf, 3 feet below water surface, built to simulate a similar shelf at Devil's Hole used for feeding and spawning.

In late September, 1972, substrata from Devil's Hole was transported to the sanctuary. Planarians, snails, beetles, and algae from Devil's Hole were also relocated. In early October, seven pupfish were collected and released in the pond that would be their new home. Two of the seven died; however, the remaining five thrived and appeared to be content. In all, 20 adult pupfish and additional planarians, snails, and beetles were brought during 1972 from Devil's Hole to the refuge. By December, observers found that all adult pupfish were surviving and appeared to be adapting well to the conditions in the tank. Spawning was taking place and at least six young fish were alive and growing rapidly. The relocating was a success, and today the exotic fishes are thriving and living happily in the refugium.

With the elevation of fish and wildlife enhancement to an important aspect of Reclamation water and land resource development, it became apparent that more knowledge was needed. To answer some of the questions, Reclamation has initiated numerous research programs. Among them are separate studies aimed at assessing the impact on reservoir fisheries of pumped storage hydroelectric power production, the effects of stream depletion on downstream fishery habitats, the relationships of vegetation management to wildlife, and the interrelationships of fish and wildlife and irrigated agriculture and resultant social, economic, and biologic impacts.

Two studies are underway on the ecological impact of pumped storage. The first is being done in cooperation with the Colorado Division of Wildlife and the Fish and Wildlife Service. It concerns the operation of the Mt. Elbert Pumped Storage Powerplant on Twin Lakes Reservoir in Colorado. The study will assess the effect of changes in the environment on both lake trout and mysis shrimp which are an essential item in the lake trout diet. Data are being collected that will permit comparison of the ecosystem before and after operation of the pumped storage facilities.

A Canada Goose nudges several newly laid eggs.

The second is an extensive study being conducted by the Fishery Research Institute of the University of Washington aimed at assessing the effects of pumped storage power operations on the fisheries in Banks Lake near Grand Coulee Dam in Washington. The studies so far have focused on the physical and chemical limnology, fish abundance, distribution, and entrainment through the pump turbine units of larval, juvenile, and adult fishes.

A 3-year cooperative study of the effects of stream depletion by diversion on downstream fishery habitats is nearing completion on the San Juan-Chama Project, Colorado-New Mexico. The Fish and Wildlife Service and the Colorado Department of Natural Resources are cooperating with Reclamation in collecting data. Information derived from this study and earlier studies in the Uinta Mountain area of Utah will provide information needed to predict the impacts of reduced streamflows, set minimum and optimum fishery flows, and assess fishery use and benefits.

Under a contract with Arizona State University, researchers are studying the relationship of vegetation management on wildlife. Data are being collected on the composition and density of plant species, soil characteristics, climate conditions, the relative density and productivity of birds, mammals, reptiles, and amphibians, and effect of various modifications in the habitat in the wildlife using the plant communities.

Would you believe a channel built entirely for the convenience of two alligators? It's true. That is just what has happened on the Palmetto Bend Project in south Texas, Southwest Region. The channel has been constructed to permit two American alligators to find their way from an isolated pond to permanent habitat. The channel is needed because the pond was located within the alinement of the Palmetto Bend Dam and had to be drained. Construction is in progress on the dam which will impound water for municipal and industrial uses.

A number of these "threatened" creatures inhabit the streams and marshes of the Palmetto Bend Project area.

With the newly created marsh-like habitat and relatively stable water level which are expected to follow the filling of the reservoir, it is likely that the alligator population in the area will increase.

An eagle nest, perched high among the trees.

The banners, balloons, and boastful speeches were over. Again the American people had registered their desire for change by voting in a new Administration. New promises, new challenges, and new approaches were the watchwords for Government policymakers.

That was the end of 1976, now in 1977 we are applying those new approaches to a 75-year-old agency. As part of the Carter Administration, the Bureau of Reclamation is being set on a fresh path—one that stresses safety, environmental protection, economic efficiency, fair distribution of project benefits, and water conservation.

As an outsider I have always held Reclamation in the highest regard. Over its 75-year history Reclamation has been viewed as a competent agency for analyzing water resource availability and needs in the Western States, and for developing programs to meet the demands for water. There have been times when the Bureau has, perhaps properly so, been criticized for having more concern about the construction of projects than for whether the water was actually needed, but I don't see that as the situation any longer.

In contrast to Reclamation's strength is a weakness—individuals who are not ready for the change. Our people must recognize that Reclamation is in a new era. They must be flexible enough to modify their attitudes and points of view. I still hear some of our employees talk about Reclamation as if irrigation were the only purpose of the program. That has to change. Until we start talking about Reclamation as it really is—multipurpose water resource utilization—then we really are not talking about Reclamation.

by R. Keith Higginson

NEW DIRECT
FOR RECLA

But we cannot suggest that people change without telling them how. I mentioned earlier that Reclamation is being set on a fresh path, one stressing five elements. Let's look into them further. First, dam safety is an area in which Reclamation is very concerned. Our experiences resulting from the failure of Teton Dam taught us that we cannot be overconfident of our ability to design and construct dams safely. We are now conducting studies to look at our internal procedures for reviewing design, specification, and construction methods.

R. Keith Higginson, newly appointed Commissioner of Reclamation, served as Director of the State of Idaho's Department of Water Resources from 1965 to 1977.

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We must be certain that we are using up-to-date technology and that there are adequate safeguards to assure that another failure does not occur. We will come out of this review better prepared as an agency to meet our obligation to public safety.

In addition to our own reviews, former Commissioner Gilbert G. Stamm instituted a program calling for independent consultant reviews of the design of major structures. This is a good program. It is to our benefit to have the reassurance that someone independent of Reclamation has looked at the design. We are committed to dam safety. If ever a question arises about the safety of our structures we will suspend activity until the question has been resolved.

We are committed to dam safety.

Examples of where Reclamation has altered its course of action based upon independent studies are Soldier Creek Dam of the Central Utah Project and Auburn Dam of the Central Valley Project, California.

W. A. Wahler & Associates, engineering consultants, were hired by Interior's Assistant Secretary for Land and Water Resources to conduct a study of the safety of Soldier Creek Dam and six other structures. On the basis of their review, which found that there may be deficiencies, individually or in combination, that could jeopardize the safety of the dam, Reclamation has halted filling the reservoir until the problems identified in the report have been resolved.

At Auburn Dam, three separate seismological studies are being conducted. The ability of the dam to withstand earthquakes will be resolved before Reclamation will complete the final design and let the construction contract.

The second and third areas of concern to Reclamation, economic efficiency and environmental protection, must be considered jointly. Environmental protection must be part of all planning. When any project proposal is presented to the Secretary and eventually to the Congress, in addition to a feasibility statement of its economic justification, there must be an environmental impact statement.

I have been concerned that decisions have been made in the past based only on the project's economic feasibility. I think the benefit-cost ratio, considered alone, is not the best way to decide whether a project should be constructed. It must be a public decision, based on the costs, benefits, and environ-

mental consequences.

We should offer one caveat to environmental groups, however. They must realize that they could gain much more by bringing their concerns to the attention of decisionmakers before the decision is made than they could by opposing every decision after it is made. Granted, in the past they may not always have been given ample opportunity, but that no longer is the case.

These people must recognize that as the Nation continues to grow, as it is going to, so will resource development continue. Hopefully their mission will be to ensure that environmental considerations are included in the project analysis before the final decision is made. Then if it is decided that, based upon environmental considerations, it is not in the public's best interest to proceed with a project, fine—but if it is decided to proceed with the project, it is hoped they will support the decision.

The fourth element of Reclamation's new direction is proper distribution of project costs. We agree that those who benefit from the Reclamation program should pay the costs of construction. Having recently toured the Westlands District in California, I can see why some people have raised a question about why others are receiving large subsidized benefits from the Reclamation program. Two main questions exist: Are individuals and large organizations farming excess lands; and second, are residency requirements being met? We will devote increasing time to these questions. However the law is interpreted, we will follow it.

The fifth element of the new Reclamation program is water conservation. We have just appointed a team to develop a set of criteria that can be applied to various Reclamation projects identifying where we can most beneficially conserve water.

Economic efficiency and environmental protection must be considered jointly.

Employing such methods as rehabilitation and betterment of projects, we hope to make gains in saving water.

Reclamation has had its share of problems. With the failure of Teton Dam and with the President's review of water projects resulting in the elimination of funding for several projects, much adverse publicity has been generated for the agency. Unfortunately, it has vastly overshadowed the good works that Reclamation is doing.

There are a number of entities which are going to use Teton as an excuse for opposing any good that may come from the Reclamation program.

The environment is of prime concern to Reclamation.

We must have a positive, aggressive public information program to get the message across regarding our accomplishments. Additionally, those who have benefited from the Reclamation program have to come forward and speak up. Otherwise Reclamation will be left to drift.

One of my major goals is to restore public confidence in the Bureau.

There has been much talk and speculation about reorganizing Reclamation. While specifics are not yet formulated, I can say that if any reorganization occurs, it will be aimed at meeting five basic goals:

1. To make Reclamation more responsive to public needs.
2. To make the agency easier to manage.
3. To implement new initiatives of the Administration.
4. To eliminate duplication of activity.
5. To identify and establish clear lines of authority.

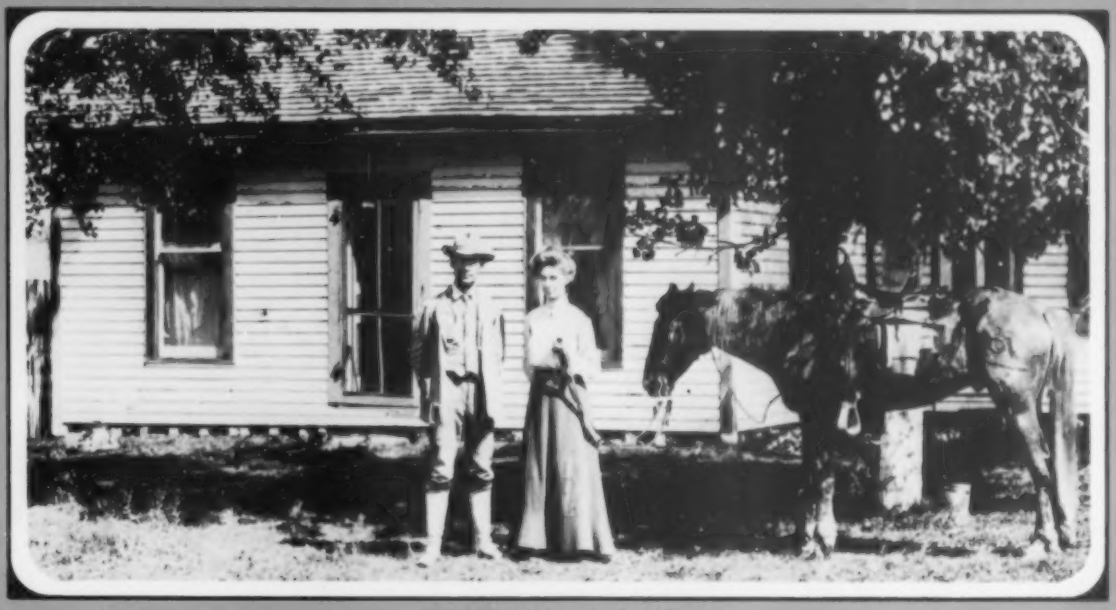
With change, possible reorganization, and new directions all facing Reclamation, one cannot help wondering what the agency's future is. I believe Reclamation as we have known it in the past will be adjusted to fit any new national water resource program. In other words, we may no longer be in a position of trying to reclaim dry public lands in the West. But we are still in a position of needing to develop our natural resources, including water.

It may be that at the Federal level there will be a reorganization of agencies which will bring together water resources management into one agency, and it may be that the name "Reclamation" will no longer exist. But the programs of the Federal Government in developing and managing water resources for the good of the Nation will continue, and we will fit into that program. Reclamation's program lends itself well to the goals of the Administration.

I am optimistic about the future of Reclamation's mission. I know we can play an integral part in the necessary development and protection of this country's water resources.

"We can play an integral part in the necessary development of this country's water resources."

THE REEDYS~ A TRUE RECLAMATION FAMILY



Oliver T. and Eva McCune Reedy.

by William Reedy

In November 1902, a young engineer working for the recently born Reclamation Service set up his level, took a backsight on a nearby bench mark, and started the surveys that were to blossom into the Salt River Project in Arizona's "Valley of the Sun."

Oliver T. Reedy was appointed as an assistant engineer in the Reclamation Service in October 1902, just 4 months after passage of the Reclamation Act. His early surveys were for the power canal that would furnish energy for constructing Roosevelt Dam, key feature of the project.

After slightly less than 2 years on the project, Oliver married Eva McCune in the small town of Stromsburg, Nebr. Eva had grown up in a rather sheltered atmosphere, but nevertheless she adapted well to the rigors of frontier life. Their honeymoon in the "little white cottage" at the construction camp of Intake was the beginning of a Reclamation career for them and their family.

William Reedy is Chief, Division of Planning Coordination at the Engineering & Research Center, Denver, Colo. Oliver and Eva were his parents.

The cottage was a simple dwelling, but it was much better than the tents in which most of the engineers and construction workers lived. It had a

The roasting pan for the turkey was a 5-gallon can sawed in half.

living-dining room, bedroom, Oliver's office, small attached shed, and kitchen with a large wood-burning stove. The utensils were simple and often homemade. The roasting pan for the turkey that first Christmas was a 5-gallon can sawed in half.

Eva serves Christmas turkey in a homemade roasting pan.

Oliver, conducting plane table surveys of the power canal.

Their children heard many tales of early life on the Salt River Project. Eva had her own horse—a gift from the men in camp—and a pearl-handled "six-shooter"—a wedding present from the groom.

The two would often take weekend trips on horseback into the nearby hills. On one of the early trips, before Eva knew the country, Oliver took her on a circuitous route before making camp for the night. Much to her surprise, the next morning Eva found that they had slept only a few hundred yards from their house. One night the two crawled on their stomachs to steal a watermelon from a nearby garden. What a delicious feast! The next morning Oliver told Eva that he had permission from the farmer to take a watermelon any time he wanted one.

Eva, wearing her "six-shooter", prepares to mount her horse, gifts from the groom and men in the camp.

The Reedys left the Salt River Project while Theodore Roosevelt Dam was still under construction. They spent several years at Orman, S. Dak., where Oliver was construction engineer for Belle Fourche Dam. Two children, Calmar and Margaret, were born there. Oliver later became construction engineer for the Grand Valley Diversion Dam on the Colorado River near Grand Junction. Calmar placed the first shovelful of concrete in this dam when he was 4 years old. The family then served two "hitches" on the North Platte Project, first constructing dams near Minatare, Nebr., and later working on the Fort Laramie Canal in Wyoming. A third child, William, was born while they lived in Wyoming.

Eva washes dishes in the kitchen of their little white cottage.

The two crawled on their stomachs to steal a watermelon.

Oliver resigned from the Reclamation Service in 1919, shortly after the family moved to Denver. He worked for 2 years as a private consultant, then he fulfilled a distinguished 29-year career as Senior Assistant State Highway Engineer of Colorado.

But the Reedys' involvement with Reclamation was not finished—it was in the family blood. Calmar and William both became planning engineers for the Bureau. After 32 years with Reclamation, Calmar retired in 1968. He is now in Iran working as a water resource development consultant. And William, now serving as Chief, Division of Planning Coordination at Reclamation's Engineering and Research Center in Denver, is still going strong after 38 years of service.

Can any Reclamation family top the Reedys' 87 years of service?

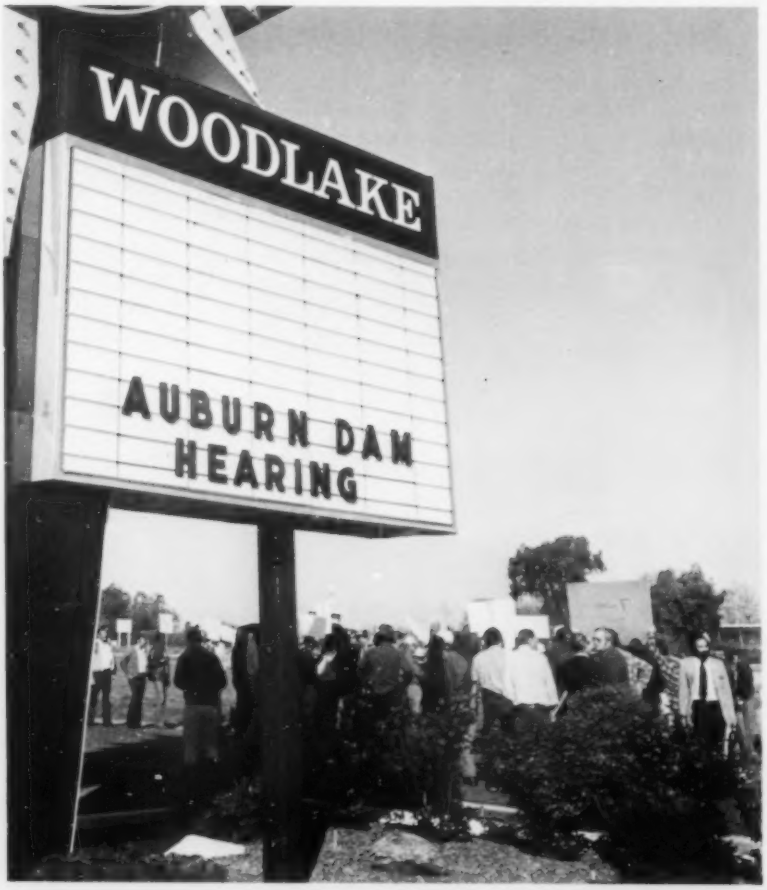
WANTED: PUBLIC OPINION

by Darrell Adams

Long gone are the days when a Government agency or a business could operate effectively without input from the public. Today, viable organizations, including the Bureau of Reclamation, seek suggestions and views from citizens during the policymaking process.

During recent years the Bureau of Reclamation has been expending much time and energy to assure that the public is given appropriate opportunities to participate in water resources development programs. The public involvement effort is directed toward the operation of existing projects as well as those in various stages of planning and construction.

Darrell Adams, a Social Factor Analyst, manages the Public Involvement Research Program, Bureau of Reclamation, E&R Center, Denver.



Reclamation uses a forum—the public hearing—to obtain public opinion.

The major goal in this effort is to make water resource development and management more responsive to what the public considers its immediate and long-range needs; not only for economic development, but for the protection and enhancement of the environment as well.

The Bureau of Reclamation has been involved in public participation since its inception as a Federal agency in 1902. The Bureau evolved in response to public requests for action needed to develop lands and water for irrigation.

Early public participation efforts probably would be classified more as "public information" than as active involvement. The focus was upon informing significant groups, or "publics," about the status or results of studies "we" were doing for "them," or reporting on the physical and economic aspects of constructed projects.

Publics who were proponents of projects received special attention. Irrigation districts, county administrators, and other local and State officials advocating a particular development were the primary constituencies. Informal contacts with such constituents were routine. Formal public hearings and reviews by other interested agencies were the primary mechanisms for divergent inputs.

Also, until recent years the kinds of water resource development activities performed by the Bureau were congruent with prevailing public attitudes and values. The Bureau was doing things people found generally acceptable and desirable. Public participation activities were limited largely to accommodating what are today called "development" interests.

Public values had been very strongly on the side of economic growth and development. Actions seen as advancing economic growth were valued and supported. Water resource development was generally viewed as enhancing economic growth and thereby received widespread public support.

In recent years, changes in social values have taken place. The value consensus regarding economic growth as an overriding goal has diminished. Other goals are competing for attention. Environmental quality, social well-being, and quality of life are examples of values having new prominence.

Part of informing the public is providing information to the news media. Dr. Roy J. Shelmon explains a study of American River Canyon.

The Federal Government has responded to the desire for greater public involvement.

The emergence of environmental values signaled the development of a set of new publics within the water resources community. They were at first a counter-constituency; they tended to view resource development as something to oppose categorically. As some of their arguments have been accepted, their position has become less adamant. Nonetheless, it is clear that the values they champion are of high relevance to the water development activities of all resource agencies. Major changes have taken place in response to these new values and the new publics.

The Federal Government has responded to the desire for greater public involvement in water resource decisions in a variety of ways.

New procedures in planning have been developed and are now being implemented. During recent years the American public has expressed its desire for greater participation. The message being sent to Federal, State, and local governments is that people desire to participate more actively in the decisions which affect the quality and character of their lives. Many of these new procedures are incorporated in multiobjective planning which recognizes both economic and environmental values in water resource development.

Formulation of viable alternative plans which emphasize economic efficiency and environmental quality goals is required by the Water Resources Council's *Principles and Standards for Planning Water and Related Land Resources.*

They also require public participation in the process of planning. The purpose of this requirement is to assure that environmental values will have representation in the planning process on a parity with economic values.

As Reclamation began implementing its new multiobjective procedures in planning, the need for changed procedures of public participation became apparent. Accordingly, a set of new guidelines was developed.

Perhaps the most advanced example of implementation of a public involvement program by the Bureau of Reclamation is in California's Central Valley Project. Many features of this large, multipurpose project have been installed to supply irrigation, municipal, and industrial water over a large area. For the past several years, Reclamation has been involved in a Total Water Management Study in the Central Valley.

Several significant innovations in public involvement were tested in this study. First, a document was prepared in nontechnical language explaining efforts Reclamation is making to examine and evaluate existing systems in the study area. It attempted to see if operations and facilities should be modified to achieve better management.

This document was distributed to over 1,100 individuals and groups concerned about the use of water resources in the area. It emphasized that the problems defined by the Bureau may not reflect all public viewpoints and that definitions of problems by the public were desired, especially where viewpoints differed. This innovation was intended to uncover critical problems and to obtain public viewpoints for full consideration in the study.

Rather than a single public meeting, a large number of small group meetings was held. Most meetings were held in the private homes of people who volunteered them for this purpose. An attempt was made to limit the number of people participating in each group to less than 20 to facilitate a free exchange of ideas.

Prior to the meetings, Bureau personnel had been specially trained in small-group, interpersonal communication skills. This facilitated communication at group meetings between Bureau personnel and members of various publics, as well as among the participants.

Reclamation representatives adopted the position of "facilitators." As such, they encouraged the expression of ideas

and values. Their role was to listen to the ideas of others and to learn what people considered important and why. They did not advocate any particular solution or insist that their views should prevail. They provided information and explanation when requested and attempted to assure balance between inputs. The expression of divergent views was encouraged during the meetings. Feelings were recognized as real and important and not requiring justification or rationalization with facts.

Viewpoints expressed during the meeting were recorded on large paper charts located within sight of all participants. Care was taken to assure that accurate statements of people's feelings and ideas were recorded. A copy of the material gathered at each meeting was sent to each participant so additional material or clarification could be prepared, if necessary. Finally, a summary of the results of the meetings was prepared and sent to all participants. In this way, a wider dissemination of the expression of values and ideas was obtained among the residents of the study area.

A substantial number of people participated in the earliest stages of this major study. More than 760 people attended the 66 meetings. A large pool of ideas about problems and potential solutions was obtained. Many spontaneous expressions of gratitude were received from people who liked the opportunity to talk about their views of water resource problems in an open and informal atmosphere. The amount of serious discussion and responsible give-and-take was very high. Angry outbursts were rare as people became convinced that Reclamation personnel were really there to listen to what they had to say.

The kind of public involvement program just described requires a substantial amount of time and effort. Such a program cannot be justified unless benefits can be expected both by the agency or institution sponsoring it and by the public.

One of the major benefits to the public is a better understanding of the problems involved in water resource development and management. Resource development has all too often in the past occurred when some agency or institution from the outside came into a local area and began to plan or construct facilities with little input from the local people. One of the consequences of this approach

A public hearing on the Auburn Dam-Folsom South Canal Project.

is that, from the local viewpoint, both the problem and the solution belong to the outside organization. The psychological ownership is all on the side of the outsider. Even if the project is seen generally as helpful or good, very little commitment to it may result.

But if local people are actively involved in the process from the beginning, a joint ownership is more likely to emerge in people's minds. It is now perceived as "we" (meaning the citizens and the agency) who are jointly cooperating to solve some of "our" problems. This psychological ownership is much more likely to result in a higher level of active involvement, creative thought, and imaginative use of the resulting product.

Historically, one of the problems plaguing water resources development is the long time between conception of the idea, and construction and operation of the project. A period of 15 to 20 years is not unusual. This planning-to-execution time lag is only partly caused by technical and design work. The bulk of it is often consumed in the political process of deciding whether to take a certain action.

Can public involvement do anything to reduce the overall time consumed? It seems possible. A well planned public involvement program provides, throughout the planning and construction period, many opportunities to modify the project better to meet the needs of the affected publics. The greater the congruity between the project features designed to meet needs and the needs themselves, the more likely there is to be active support for the project. There also is a lesser chance that a project will be held up during the expensive construction stage by court suits and delays in funding or abandoned after years of effort and large expenditures of time and money.

People desire to participate more actively in the decisions which affect the quality and character of their lives.

One of the side effects of this kind of public involvement is a change in the relationship between Reclamation and the various publics it is trying to serve.

In general, the more familiar people are with something, the less likely they are to fear or distrust it. The same is true with a Government agency. The better citizens understand how it works, the people who work for it, and what its capabilities and limits are, the less likely they are to fear it. Eventually, as interaction continues, presuming it occurs as openly and honestly as possible, the more likely they are to trust Reclamation and its judgments. Thus, a significant byproduct of a carefully executed public involvement program is an improvement in relationships.

Another benefit both to Reclamation and to its publics relates to changing values. Often, when social values are undergoing rapid changes, it becomes difficult for people of a community to specify or agree upon goals. It is entirely possible that an agency, through the process of implementing its own public participation program, may serve as a catalyst. The process of bringing people together in ways which facilitate communication can serve to crystallize goals on which consensus can be obtained.

Thus, Reclamation's attempts to discover what the goals and values are may facilitate the emergence of a set of goals where there had previously been no consensus. The development of goal consensus is helpful to both Reclamation and the community. Both Reclamation and the community then have an idea about which direction to follow.

MORMON CONTRIBUTIONS TO IRRIGATION

by Carlos Whiting

Mormon * settlers were not the first to irrigate land in the West, but they were the first to stake their entire fortunes and future on an irrigated economy. Winning their "gamble," Mormons in a very real sense became leaders of the reclamation of scarce water and arid lands in the United States.

Apart from the limited irrigation practiced at Spanish missions in the Southwest (combining age-old Indian skills in water conservation with Spanish knowledge of storage dams), intensive irrigation in the United States began with the arrival of Mormon pioneers in the Valley of the Great Salt Lake in July 1847.

Carlos Whiting is a Washington, D.C., environmentalist and a writer on natural resources, currently with the Bureau of Reclamation.

* Mormon is a commonly-used name given to members of the Church of Jesus Christ of Latter-Day Saints.

Dr. John A. Widtsoe views the Jordan and Salt Lake Canal, one of the earliest irrigation canals in the Salt Lake Valley.

In 1909, ditches were dug primarily by hand.

The Mormons, having settled in Missouri and run afoul of local slave-holding sentiment because of their own New England-born abolitionist tendencies, fled under persecution to Illinois. There, Mormon prosperity and accelerated growth in numbers led to local fears of Mormon political domination in the State. Once again, harassed, they followed Brigham Young to what is now Utah.

Dry and almost barren, the area was Mexican territory and settled only by nomad Indians and a few trappers. Knowing of the territory in advance from scouts, Young said: "If there is a place so utterly forbidding and undesirable that no one else will want to live there, that is the place to go" and, "If our enemies will leave us alone 10 years, we will ask no odds of anyone."

Utah historian William R. Palmer wrote in 1947 that Mormons "did have one intangible asset, which others lacked and which counter-balanced the handicaps. They had a vital unity of purpose and a constructive philosophy of life under which they could focus their meager resources on a common cause . . . [enabling] them to set community interest above individual gain."

Mormons established their own State of "Deseret," including an office of public works, a watermaster, new water codes and water courts (actually, church courts), and innovative settlement patterns. Small farmsteads of 10 to 40 acres radiated from central communities. Each was irrigated through short canals from simple stream diversions. All had a profound effect on the development and settlement of the entire West.

Abandoning the eastern idea of riparian water rights, which held that water could not be used (as in the operation of navigational locks or for milling) without returning it substantially undiminished to the stream, Mormons devised the concept of prior appropriation. This attached water rights to the land where irrigation water was first put to beneficial use. When the land was sold, rights to the water passed to the new owner.

However, these early settlers also recognized the concept of community responsibility in the use of water. Water development was not a speculative or an individual effort, but a cooperative venture.

Essentially, a Mormon farmer could apply for and develop water sufficient to meet the needs of his family-size farm. In cooperation with other farmers, he contributed a proportionate amount of work and capital to develop and maintain water diversions and canals and in return received shares in the water. Thus evolved the idea of developing and managing water through the legal instrument of a water district, where the total water need was recognized and had preference over the need of individuals.

The Mormon "cooperative" developments were generally accomplished with simple, ingenious devices. Surveying levels were often little more than bottles filled with water. Construction equipment consisted only of men with shovels and teams of horses pulling simple scoops and scrapers. Because of the availability of small streams from mountain watersheds for diversions, no sophisticated engineering techniques were needed to build major dams for water storage.

In 1850 there were 11,000 settlers in the Salt Lake area and 16,000 irrigated acres were farmed. With the naming of a Mormon Superintendent of Public Works, local communities were no longer dependent solely on their own skills and experience in the construction of water works. Farmers in water districts were able to obtain help in planning, directing, and financing their projects, first from the Church and later the Territorial Government.

The Deseret Agricultural and Manufacturing Society, organized by top-ranking Church officials in 1856, experimented with new field crops, distributed seeds to Mormon settlements, and taught farmers improved methods and irrigation techniques.

A practice of the Mormon Church was to "call" industrious and relatively prosperous farmers to resettle in new communities—to open new territories for settlement by migrants and converts from the East and Europe—to widen and extend irrigation techniques, efficiencies, and concepts of water districts, water rights, and water laws, from Mexico to Canada.

The cohesiveness of the Mormon community and the high degree of cooperation among its members offered a sharp contrast to the isolation and individualism of most American frontier communities. Fortuitously, Mormons were the type of yeoman farmers envisioned by Thomas Jefferson—sturdy, independent, yet maintaining a rich and satisfying social life.

The combination of unique demands from their own society and the harsh environment led to the evolution of many features now recognized in the West as "Reclamation."

Methods of fencing irrigated fields near Salt Lake City, Utah, were illustrated in the *Harpers Weekly* (mid 1860's). Photo credit: Utah State Historical Society.

Reclamations Original Survey Party... The Dominguez-Escalante Expedition, 1776

by W. L. Rusho

As the warm days of September 1776 trailed away, a young Franciscan priest, standing on a hill overlooking the tall native grasses of Utah Valley, wrote in his journal, "as many Indian pueblos can fit inside the valley as there are those in New Mexico. . . . All over [the valley] are good and very abundant pasturages, and in some sections it produces flax and hemp in such abundance that it seems as though it had been planted purposely."

Fray Silvestre Velez de Escalante was only 26 when he wrote those words, but his life in the villages of New Mexico had sharpened his appreciation of the precarious dependence that settlers of the West placed on water. Furthermore, his long journey from Santa Fe had taken him through a succession of semiarid valleys where he saw that only irrigation from rivers and streams could make the land habitable.

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Actually, Fray Silvestre was but one of two priests with the expedition, the other was the man in charge, Fray Francisco Atanacio Dominguez. In practice, however, the two men were co-leaders, so it is referred to correctly as the Dominguez-Escalante Expedition of 1776. Escalante's name (which actually is Velez de Escalante), has become the better known, since he was the one who wrote the daily journal entries.

Dominguez and Escalante left Santa Fe with eight men on July 29, 1776, making a late start on a journey of exploration northward hoping to find a new and better route to Monterey, Calif. That they might be stopped by the approach of winter was a foregone conclusion, but at least they would learn of new lands where Indian missions could be established. They were also mindful of the white settlers who might follow their pathway toward the shadows of a land yet unknown. Therefore, they entered in their journal not only distances, compass directions, and topographical descriptions, but also prospects for new settlements and for agriculture. This journey took them through parts of what today are 17

Reclamation projects in New Mexico, Colorado, Utah, and Arizona.

A few things were already known about the land to the northwest. Earlier Spanish trading forays had penetrated at least as far north as the Delta, Colo., area, and perhaps as far west as Moab, Utah.* Various bands of Ute Indians (called "Yutas" by the Spaniards) roamed through much of the land, and some of these bands had talked to settlers and soldiers along the New Mexico frontier. From Ute descriptions, Spaniards knew something of the several rivers that drained the upper Colorado River basin. They also learned of a large lake and green valley farther to the west.

As July blazed into August, they made their way north, then west, through the forests of New Mexico, passing by the future sites of El Vado and Heron Dams on and near the Chama River.

Crossing the Continental Divide south of Dulce, they wandered a bit before they finally reached the San Juan River at the present Colorado State border.

Two days later they passed by the mouth of the Piedra River, now the upper end of Navajo Lake, and rode just north of Arboles toward Ignacio, Durango, and Mancos. Years later these would be project lands of the Pine River, Florida, Animas-La Plata, and Mancos Projects.

Although they could not know of the great Indian ruins at Mesa Verde, they did visit a small collection of ruins on a hill overlooking the Dolores River. In a few years their old campsite will be covered by the upper end of McPhee Reservoir. The ruin they visited has been excavated

* In the description of the expedition that follows, the names of many modern places appear. Except those in New Mexico, most of these names did not exist in 1776. Therefore, the reader must assume that, for example, "near Montrose" [or any other familiar place name] means near the future site of that town or water development project.

by the Bureau of Land Management and is now one of the visitor attractions near the towns of Dolores and Cortez.

To avoid the deepening Dolores River Canyon they cut overland to the west, yet they had to return to cross the river near Slickrock. Here they changed their general direction from northwest to northeast, toward the San Miguel River, the Uncompahgre Plateau, and the Uncompahgre River.

In his diary Escalante told of a river "among the Yutas called Ancapagari" (which, according to our interpreter, means Red Lake). He elaborated that "Here is a meadow of good land for farming with the help of irrigation. . . . There is all the rest needed for establishing a good settlement on it." One hundred and thirty years after these words were written the valley became the site of one of the Bureau of Reclamation's first projects, the Uncompahgre Project. Nearby is the more recent Bostwick Park Project. On the Uncompahgre River itself, near the point where the padres first reached its banks, Ridgway Dam of the Dallas Creek Project will soon be built.

While in the Uncompahgre Valley, Dominguez and Escalante obtained as a guide a Ute Indian, who brought along his wife,

Yes, the assembled Utes were indeed friendly.

another woman, and five children. But this guide did not lead them west, toward Monterey, but rather north toward the long, flat-topped mountain known as Grand Mesa. On the east of this green and well-watered plateau the Utes were conducting a late summer meeting. The padres agreed to go because they could learn more about how Indians would react to their message of Christian salvation.

On their way toward Grand Mesa they passed future lands of the Smith Fork, Fruitgrowers Dam, and Paonia Projects.

Yes, the assembled Utes were indeed friendly. Moreover, a few of them were visitors from the Utah Lake region. One, a chief they named Silvestre, consented to guide them to his homeland. The Spaniards also agreed to take along an 11-year-old boy who was named Joaquin.

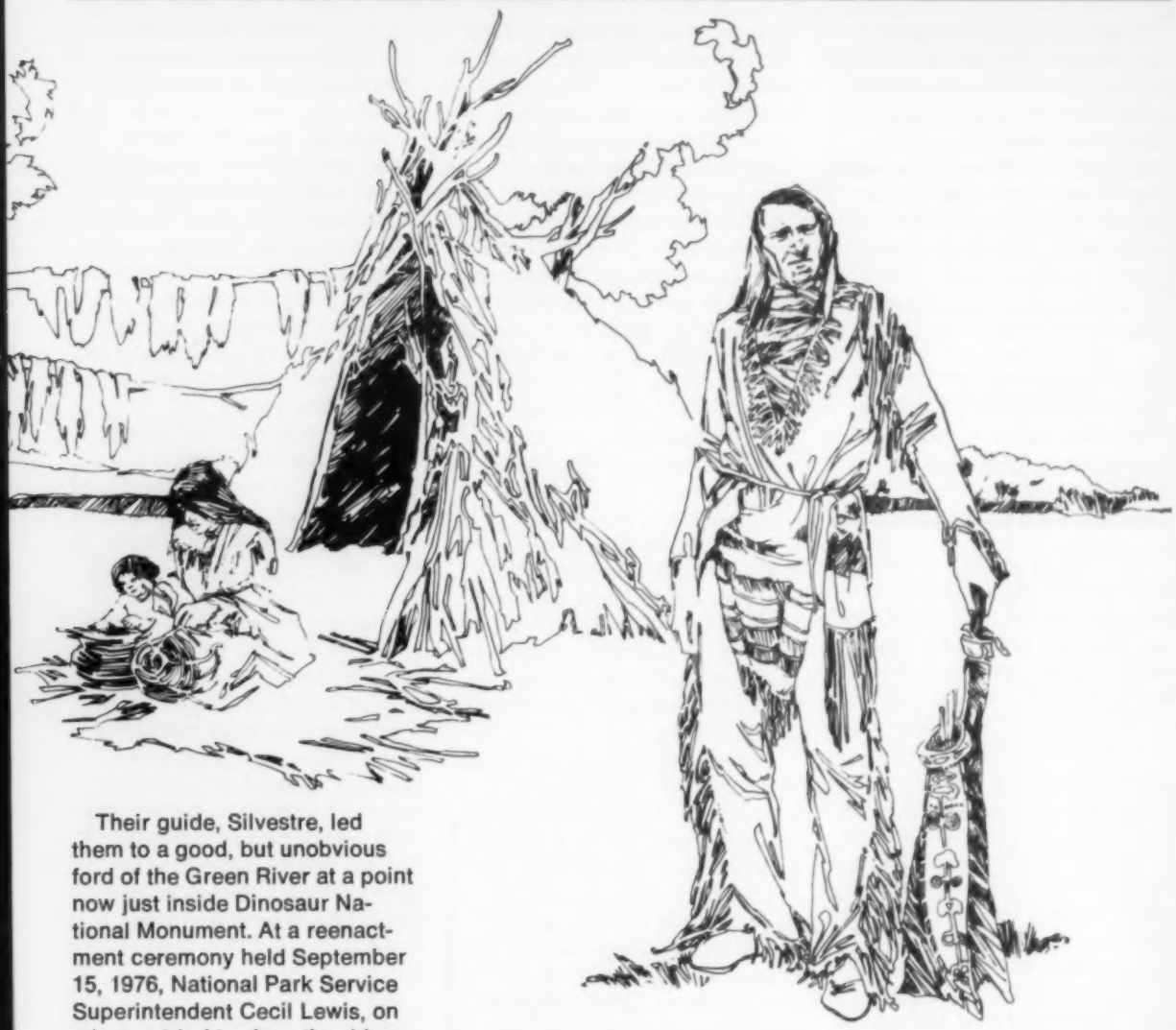
Descending the mountain slopes they passed a Ute camping site in a valley that would later contain Vega Reservoir.

They rode through the Collbran area, then crossed lofty Battlement Mesa and plunged downward through thick brush toward the Colorado River. The date was September 5.

They reached the river near the railroad siding of Una, a few miles upstream from the town of Debeque.

Flowing to the southwest, the Colorado was clear, fairly shallow, and easy to ford—far different from the same river they were to encounter 2 months later.

North of the Colorado rose the unclimbable oil shale cliffs, but the trail led along the foot of the cliffs toward the northwest, up Roan Creek, Brush Creek, and Carr Creek, then over the divide into the east fork of Douglas Creek. They forded the White River near Rangely, Colo., and entered the present State of Utah.



Their guide, Silvestre, led them to a good, but unobvious ford of the Green River at a point now just inside Dinosaur National Monument. At a reenactment ceremony held September 15, 1976, National Park Service Superintendent Cecil Lewis, on a horse, tried to show the riders where to cross. But he picked the wrong place. In full view of the assembled audience, his horse stepped into deep water and floundered, forcing the embarrassed Lewis to swim for shore. Fortunately, the proper shallow ford was located at a point just upstream.

In 1776, Dominguez and Escalante and their men had no trouble on their ride across northern Utah toward Utah Lake, thanks to their Indian guide who watched out for Comanche Indians and kept the horsemen hidden in draws and gullies.

They passed through the present site of Starvation Reservoir, then went up the river to the Strawberry Reservoir area where the young Indian, Joaquin, shot two large trout with his bow and arrow. Even in those days the river through Strawberry Valley provided good fishing.

Topping the divide into the Great Basin, the padres followed their guide into Diamond Creek to Spanish Fork, then down the latter to Utah Valley, arriving September 23. Most of the many Utes living in the valley ran in fear at the approach of these ominous-appearing strangers, but the soothing words of Silvestre soon turned fright into joyous welcome.

The soothing words of Silvestre soon turned fright into joyous welcome.

For the next 2 days, Dominguez and Escalante conferred with the Utes and examined the well-watered valley. The mapmaker on the expedition, Bernardo Miera y Pacheco, called it "the most beautiful valley in all of New Spain." The fine reception given by the Utes and the excellent prospects for both farming and settlements convinced the Spaniards that here was the most likely spot for a major mission. Perhaps without realizing the difficulties of placing a mission so far from the already fragile and underpopulated colonies of New Mexico, the padres promised to return within a year.

Waving goodby to their newfound Indian friends, the Dominguez-Escalante Expedition members headed toward the southwest, still hopeful of crossing the several mountain ranges to California. But within just a few days the wind turned cold, and the inhospitable mountains to the west turned white. Wet snow turned normally hard desert valley floors into quagmires.

Reassessing their position, the two padres announced that they would return to Santa Fe rather than continue the attempt to reach Monterey. Some expedition members grumbled, others openly complained, for they had hoped to win fame and fortune in California. The choice was therefore left up to God by a casting of lots, which probably meant drawing a name from a hat. Fortunately for the survival of the expedition, the lot was cast in favor of return to Santa Fe.

Their choice was to make a shortcut trek across what is now southern Utah and northern Arizona. If they could have known even a little of the rugged, twisting, saw-cut canyon country that stretched before them, they might have chosen to return by another route.

Leaving the Great Basin south of Cedar City, Utah, they followed down Ash Creek, then crossed the Virgin River, which they named El Rio del Pilar, for the nearby formations in Zion National Park. Having lost all Indian guides, they were forced to follow vague directions obtained from occasional Indians seen along the trail. Their wandering led them first south, into the present Arizona Strip, then across burned out volcanic fields to the northeast. Their objective: an obscure ford across the Colorado River.

Failing to interpret Indian directions properly, they turned too soon toward the river, which took them into the cliff-lined confines of Lee's Ferry, a place with no apparent exit. With a touch of humor, the padres named their camp "Salsipuedes," meaning "get out if you can."

At Lee's Ferry the river was deep, with swirling currents of brown water—obviously not the described Indian ford. Yet they were at least by the river's edge, where an attempt could be made at a crossing. For a week they tried, first swimming, then rafting, but the river current was too strong. They would have to find another way out.

Up the nearby Paria Canyon, one of the scouts found a place where the cliff might be climbed. It was difficult, says Escalante, even "impassable," but somehow they made it to the top. From there they could make Wahweap Creek before nightfall.

Today, the spot where they reached Wahweap Creek is the busiest place on Lake Powell. The expedition rode across the site of Wahweap Lodge and Wahweap Marina and camped just north of the present Arizona-Utah border beside the creek. For the next few days they attempted to find the Indian ford, but the steep cliffs and deep

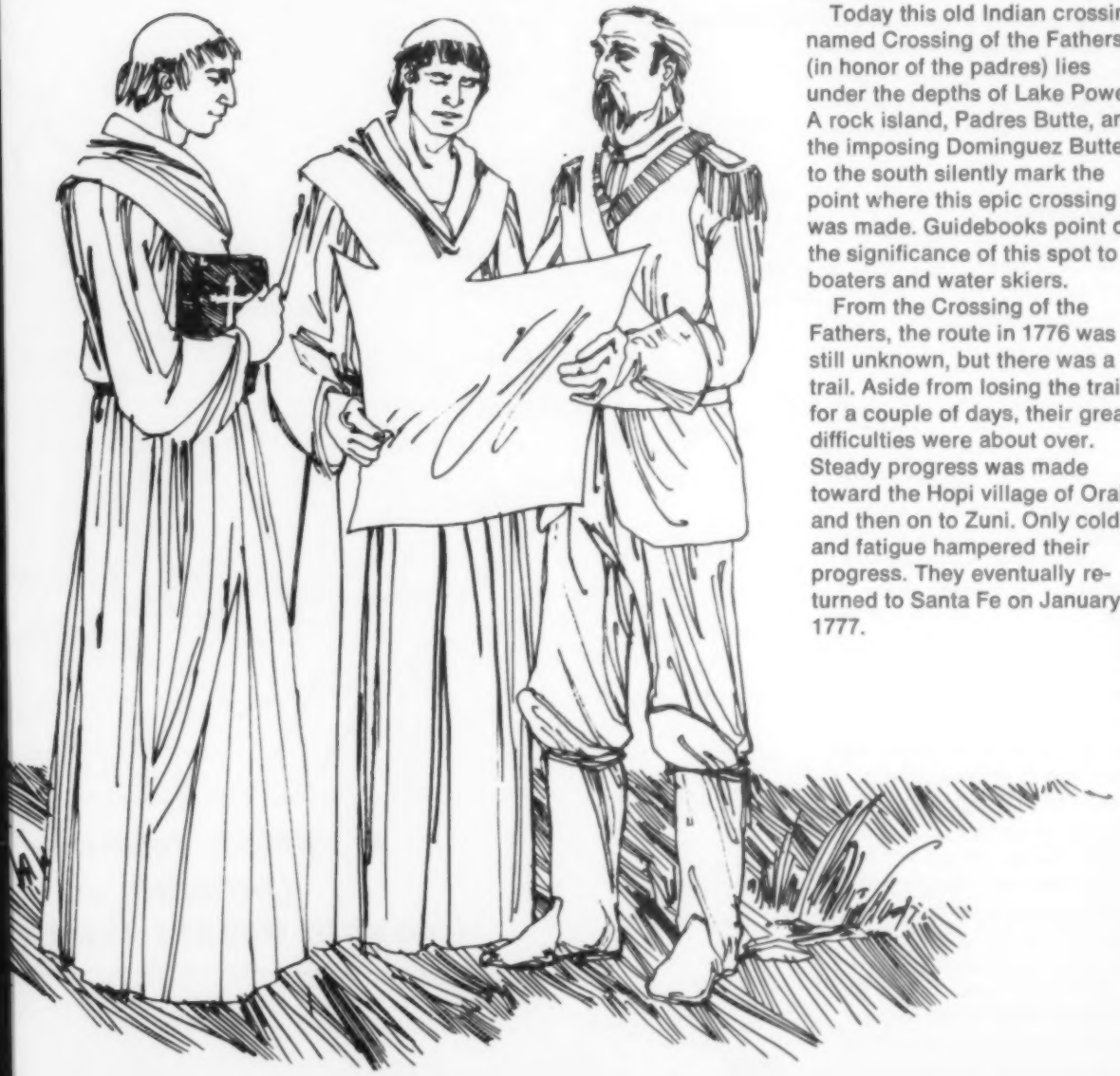
river prevented a crossing. By then they were roasting cactus and killing their horses for food. Rain, snow, and wind occasionally hurled at them across the sandy desert.

On November 6, a scout reported that the ford appeared to be up ahead. Access to the ford itself involved descent down a rocky side canyon, then a ride down the bank to a wide bend. Here the shallows ran clear across; if a mounted rider crossed carefully, neither he nor his horse would have to swim.

The next day, November 7, 1776, the crossing was made. Dominguez and Escalante praised the Lord and fired off some muskets in their enthusiasm and joy at having overcome the terrible problem of fording the river.

Today this old Indian crossing, named Crossing of the Fathers (in honor of the padres) lies under the depths of Lake Powell. A rock island, Padres Butte, and the imposing Dominguez Butte to the south silently mark the point where this epic crossing was made. Guidebooks point out the significance of this spot to boaters and water skiers.

From the Crossing of the Fathers, the route in 1776 was still unknown, but there was a trail. Aside from losing the trail for a couple of days, their great difficulties were about over. Steady progress was made toward the Hopi village of Oraibi, and then on to Zuni. Only cold and fatigue hampered their progress. They eventually returned to Santa Fe on January 2, 1777.



Thus, the Dominguez-Escalante Expedition passed into history. These men, on their 1,800-mile swing, had learned much about the Upper Colorado Basin and the Great Basin, yet the trip had little immediate significance. Spain and its remote New Mexican colonies were simply too weak and impoverished to push colonies still further north. Spanish traders later used portions of the Dominguez-Escalante route as they traveled to Utah Lake or to Los Angeles.

Fur trappers from Taos also traveled much of the route during their trips to the north. Yet most of the world—even the Americans then moving into the land—knew almost nothing about Dominguez and Escalante until about 1860. It was not until 1975, when in-depth research was conducted on the trail, that a true picture of the epic nature of the 1776 trip began to emerge.

Today we can appreciate not only the human struggle of the trip, but also the insights that the two padres and their mapmaker, Miera, recorded bit-by-bit around each evening campfire. The Dominguez-Escalante Expedition of 1776 has indeed emerged as an event worthy of the interest of all Americans.

An outbound journey through the fertile lands of future Reclamation Projects
Salt Lake City
Vernal Unit (C.U.P.)
rovo River
Moon Lake
Provo
Midview Res.
trawberry Res.
Starvation Res. (C.U.P.)
Green River
Colorado River
U T A H
Collbran
Vega Res.
Grand Junction
Paonia
Smith Fork
Uncompahgre
Montrose
San Miguel
Dallas Creek
C O L O R A D O
Rio Grande
Dolores
Mancos
Florida
Pine River
Animas - La Plata
Powell
San Juan River
Page
Glen anyon Dam
Navajo Res.
Heron Res.
San Juan - Chama
A R I Z O N A
N E W M E X I C O
Oraibi
Start July 29, 1776
Finish January 2, 1777
SANTA FE
Middle Rio Grande
Albuquerque
Zuni

THE HATCHES OF SCIPIO

by Kathy Wood Loveless

The torrid land stretched for miles, broken only by sagebrush that had scratched its way through the ground's crust. Occasionally a jackrabbit or a dust-covered lizard sped by verifying that some forms of life could exist on this dry land.

Kathy Wood Loveless is a Public Information Specialist, Bureau of Reclamation, Washington, D.C.

Frank S. Hatch and his wife Charlotte (Lottie) Cottam and their six children*—Mary, William (Bill), Anna, Frank C., Charlotte, and Helen—wended their way through central Utah heading toward the small town of Scipio—population 530. Having applied for and received homesteading rights, they left Salt Lake City for Scipio in the early summer of 1919.

Lottie Cottam and Frank S. Hatch
with Mary, Charlotte, Frank C., and Anna, while living in Salt Lake City.

*Kathleen, Alice, and Johnette were born after the family arrived in Scipio.

His daughter Anna remembers that while in Salt Lake City her father had been responsible for the construction of several powerplants in northern Utah, southern Idaho, and western Montana. "In 1927 Father took Mother and me—I was 14 years old—to visit those plants that were still in operation," Anna said.

Frank S. had chosen to give up his position as an electrical engineer in Salt Lake City to test his hand at farming one of the most desolate areas of the State and to help establish rural electrification in central Utah.

"When we were hit by the drought, life became almost unbearable."

When Frank S. and Lottie left Salt Lake City, they left behind running water, electricity, and the culture offered by a thriving Mormon city. Frank was instrumental in bringing electricity to Scipio, but it did not occur until December 20, 1929.

He had even more difficulty with farming—more because of the adversity of the land and the climate than lack of skills or hard work.

Daughter Helen said, "We could have survived the depression of the 1930's, but when we were hit by the drought, life became almost unbearable. We had to turn the pigs loose in hopes that they could find food on their own. Unfortunately, one was shot by a nearsighted deer hunter."

The cold Scipio winters were hard on man and beast.

Bill, Dorothy and Claralynn Hall, and Frank C. rested from work to play with the pigs.

In times of limited wealth a farm's worth is determined by its crop potential as well as its livestock. It is no wonder the family, unaware of the mishap, felt miserable when seven horses and a colt broke through a fence into a field without water. Six of them died of dehydration without realizing they could get water back on the other side of the fence. The colt suckled its mother to death before it finally died, too.

In February 1873, the Scipio Irrigation Company was organized. Bill, the only one remaining on the farm, notes that his father served as watermaster (one who oversees the distribution of water). The water schedule was posted in the post office for all to see. Bill recalls, "When it came your turn to use the water, be it 3:00 or 4:00 in the morning, you got out of bed to use it. Frequently I helped Dad open the main gates to release the water for the irrigators. We soon learned that the pure test of an honest man in a dry country is whether or not he would use water when it was not his turn."

At age 6, Anna rode with her father to keep him company when he opened the gates. "I rode on the back of the saddle to the head gate. It seemed such a long, long time that he was gone. He turned the water into the big ditch that ran in front of the house. This large ditch supplied all the smaller streams. Every block had a small ditch running in front of the tree-lined streets. There were larger ditches about every other street to supply the farmland further west.

"Our home gardens, lawns, trees, and shrubs were watered from a small stream about 1 foot wide and 8 to 10 inches deep 3 blocks from the big ditch. After watering cottonwood trees, grass, and weeds along the way, the stream finally recovered enough water to irrigate 2½ acres. It was an engineering feat to force water down 20 to 30 rows of potatoes and corn and on into the vegetable garden. If water was running in front of our home on Sunday we would bucket out and carry enough water to fill three No. 3 tubs with the softer water for our Monday weekly wash.

"Father and my two brothers would work 24 to 36 hours to water our grain and alfalfa fields.

"Many fights and more serious problems resulted from people stealing water—water is life.

"Many fights resulted from people stealing water —water is life."

"My father would catch a wink of sleep under a tree or on the ditch bank between furrow water changes. At night the changes were made by the light of the moon or a kerosene lantern. Dams were made from willows, boards, rocks, soil, and sheets of canvas. A shovel and hoe were always essential to 'turn' the water. I remember how utterly exhausted my father and brothers would be after regulating the water, and still they had to do chores and start the day's work.

"Every home and farm had an open well with buckets or a windmill a short distance from the house. These wells supplied water for livestock and

Bill and a friend prepare to camp in the Beaver Mountains.

household needs. Our property had a windmill which supplied four large storage tanks—which were about 6 to 8 feet deep, 10 feet in diameter, and completely lined with galvanized tin. An oblong one butted up against the windmill platform, and one was on a 2-story-high platform. Irrigation supplied our needs so we never needed to use the storage tanks for water storage purposes. But they would have been essential if there had been wind to turn the windmill."

Bill describes another irrigation technique, called "lay off." It required a rig with two horses to dig furrows. The water was then allowed to trickle off the furrows into the crops. When water was sufficient (it was never plentiful), the ditches were flooded. And the number of crops the farmers could get during one growing season depended upon a combination of the rainfall and available irrigation. "In good seasons sometimes we could get two crops, sometimes three," Bill said.

On December 11, 1925, a major breakthrough occurred in the small town.

The townsfolk, under the direction of Frank S., had water piped from the springs 16 to 18 miles away. They had to dig trenches 5 to 6 feet deep to protect the pipes from the severe freeze that occurred in the 20-degree-below-zero weather. It was accomplished by hand labor.

Anna says, "I can still see my brothers and father digging and throwing up the soil, laying the pipes, using the hot lead to cement joints, and finally filling in the trenches. There was no back hoe in those days, just a pick and shovel. We were one of the first to get a tub in the bathroom. Saturday became the day for a 'public' bath for the neighbors. It was delightful to have a tub to sit in and hot water from a tap—not drawn from a well or carried from the ditch, and this was 1927."

Just as hard work was necessary to secure a supply of water, hard work was also needed to preserve the produce.

Helen recounts other experiences on the Hatch farm.

"We grew all our own vegetables and stored them in the cellar in buckets of sand to preserve them throughout the winter. With the exception of wild currants, green gage plums, and gooseberries, fruit

Bill loved his unusual horse with the red ears.

was virtually nonexistent, but we each got an orange every Christmas. Mother made eight loaves of bread every day and we made all of our own condiments, such as mustard. When drought hit, we had to shoot calves and bottle the meat.

All kinds of hand skills were essential in the community. Some were more unusual than others. Lars Jensen, the coffinmaker, carved and constructed coffins for the townspeople. Being a foresighted man, however, he carved his own coffin and perched it in his living room where it resided for several years. He figured it was silly for his only living family member, a daughter, to have to pay someone else to make a coffin when that had been his life-long trade. He would take me into his living room and explain how the clasps worked on his coffin and that they were handmade instead of commercially made, but it still gave me the willies."

Mary, who later became a playwright and author, shared some of the flavor of Scipio life in her play *Stoves*, in which she told of the old black stove and her intense desire to get rid of it. The play was performed throughout the Midwest around 1937.

Johnette, also an author, wrote of her Mother's bread-baking in *Five Loaves of Bread*, a children's story.

The Hatches were an educated family. Even at a time when money allowed for little food or shelter, education was of supreme importance. Frank S. had received a bachelor degree in electrical engineering in 1907 from the University of Utah, and Lottie had a bachelor degree in education. Of the nine children, eight, through great personal sacrifice and by one child helping the next younger, obtained college degrees.

For Lottie, leaving Salt Lake City was most difficult because it meant giving up singing in the Mormon Tabernacle Choir—her true love. But her skills in music were quickly recognized and she spent many years as a choir and drama director in the Scipio church. Frequently the citizens of Scipio called upon Lottie to write speeches for church programs or community gatherings. And in 1956 she was selected as Utah's finalist from Scipio for "Mother of the Year."

It was the Mormon tradition that brought this hearty family to Scipio. Spurred by Brigham Young's admonition for the Mormon saints to help settle the State, pioneers moved to Scipio (then named Graball) in 1857. Shortly, Indians gave the settlers trouble so President Young suggested they move further from the mountains, down near the center of the valley. In 1863 the old settlers moved to the new townsite where it is now located. Frank S.'s parents, William Ira and Margaret Muir Hatch, settled soon after. When Scipio became incorporated in 1900, William Ira was on the first town board—yearly salary $10.

Never was there a time when water was not a primary concern. One of the first tasks of the settlers was to construct a small dam of sod and brush to back a reservoir, called Lake Scipio. Lying 9 miles south of Scipio, the reservoir was fed by springs and winter runoff from the upper valley. The amount of water allotted to each individual was determined by the amount of work one did in constructing the dam and making ditches. Canals and ditches were dug by the pioneers, allowing water to come to the valley to irrigate the farmlands of wheat, oats, barley, and alfalfa, as well as domestic gardens.

There are pioneers in all eras of time—individuals who have vision, drive, industry, and a desire to improve life.

Unfortunately, on February 28, 1886, the dam broke, inundating 100 acres of plowed land. The sod-and-brush dam was too weak to hold the increased supply of water. That spring, a stronger and larger dam was built of rock.

Bill explains, "The soil surrounding Scipio is still fairly good for growing alfalfa and grain. By alter-

The three Franks—
Frank W., Frank C., and Frank S.

Hard workers—these are the people who are part of the Reclamation tradition.

nating the two crops, alfalfa 10 years, grain 2 years, etc., the soil can be rejuvenated.

"From time to time, rye and wheat have been grown, but now the planting of wheat, especially the Russian variety called 'crested wheat,' is not economical.

"Now the greatest problem we face, besides the severe drought, is that the once good-sized farms have been chopped up by roads. The smaller pieces of land are extremely hard to farm."

As a child, Bill loved to visit his grandparents on the farm and was delighted when his own family moved south—farming and the church have been his life. But it has not been an easy life.

When asked what he is growing now, Bill replied "grey hairs." The drought was so bad this year nothing was planted—there is just no water. As a consequence, he and his family are living on their "one-year supply."

In the Mormon Church all members are asked to maintain a one-year supply of food and other necessary items for each member of the family. The purpose is suitably demonstrated here—to thwart hardship during times of drought, disaster, or other shortages.

"Even if a family did not have a supply, they would not go hungry in Scipio," Bill explains. "The church welfare program always provided for those who did not have enough food. On Fast Sunday (one Sunday a month in which all members are asked to forego two meals and contribute their equivalent value to the Church for redistribution), if someone did not have money to give, they would give a scoop of sugar or some potatoes. I remember collecting fast offerings one hot summer Sunday. I had no problem collecting the sugar or potatoes, but one woman had just churned some fresh butter and wanted to offer a pound of it.

"Overall church attendance seemed higher then. It may have been because they were less tolerant then of members who were inactive and they would be excommunicated. Also it was far more difficult to work on Sunday and skip a meeting because then you had to hook up the horses, not just push a button or pull a switch."

Scipio is in the area of the Bonneville Unit of the Central Utah Project and Sevier Bridge Reservoir has provided some water for irrigation, but the drought this year has been so extensive that even this amount of water has been depleted. Plans have been in the making to expand the holding capacity of the reservoir and to increase overall water storage in the unit, but it is uncertain whether these plans will be implemented.

Even if more water is not provided, people like the Hatches will continue to ferret out a living even in the most difficult of lands. There are pioneers in all eras of time—individuals who have vision, drive, industry, and a desire to improve life for themselves and others. These are the people who settled the West, and the people who will work to strengthen the country in the future. These are people who are part of the Reclamation tradition.

RECLAMATION'S CULTURAL RESOURCE LEGACY

by Diane Gelburd

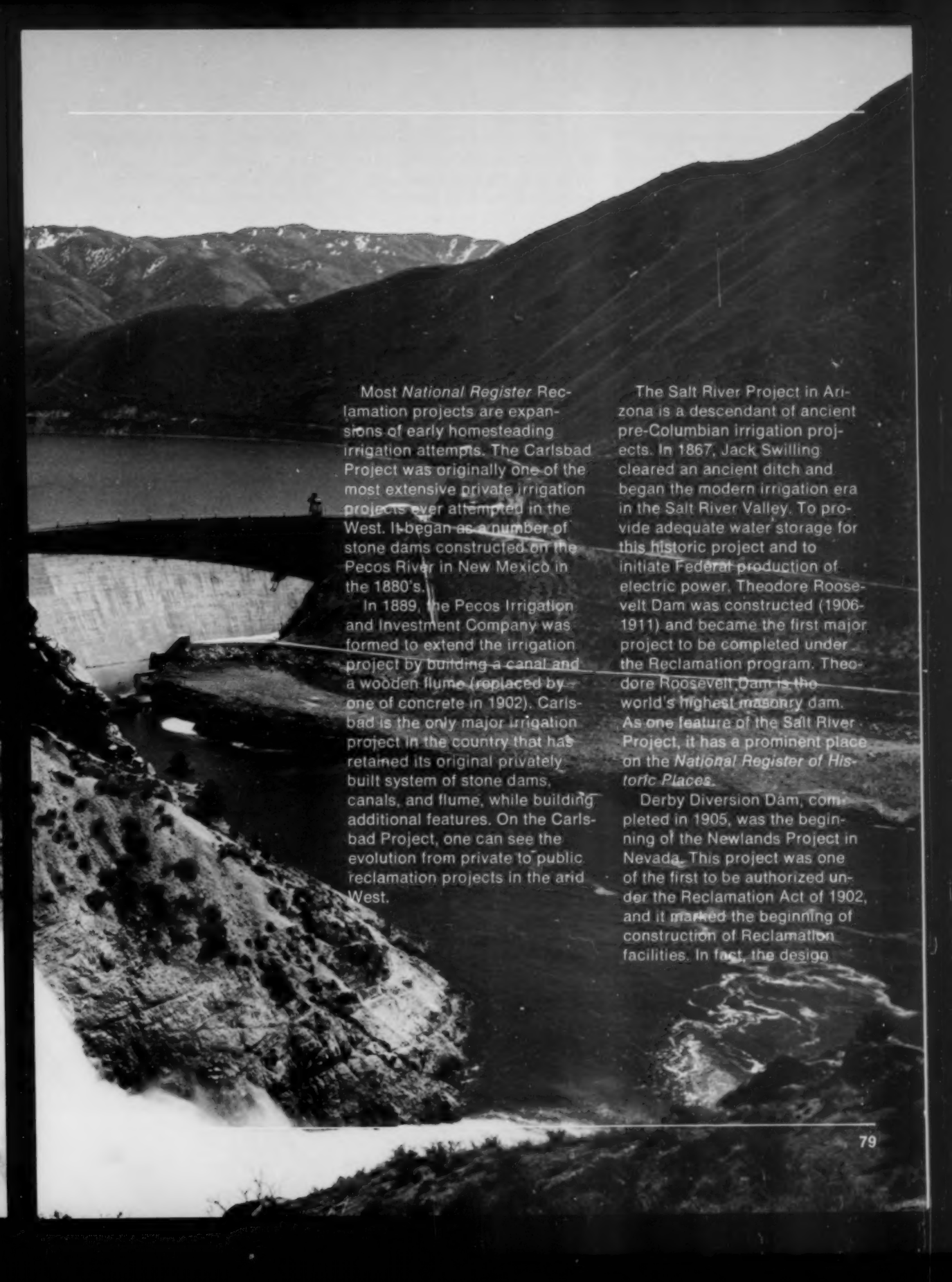
The irrigation of arid lands is a practice almost as old as civilization and in the West it is almost synonymous with settlement.

Many areas could not be homesteaded until water was provided by the projects constructed under the Reclamation program. Many Reclamation projects are now considered part of our Nation's cultural resource legacy. They are recognized as significant structures in the field of industrial archaeology and are listed on the *National Register of Historic Places*.

The *National Register of Historic Places* is the official Federal list of the Nation's cultural resources that should be identified, evaluated, and protected. Properties are listed according to their significance in American history. The *Register* provides protection for cultural resources and our Nation's heritage.

Some of Reclamation's earliest water resource development projects that are listed on or are eligible for the *National Register* include: Theodore Roosevelt Dam, Salt River Irrigation Project, Ariz.; Carlsbad Project, N. Mex.; Derby Diversion Dam, Newlands Project, Nev.; Conconully Reservoir and Dam, Okanogan Project, Wash.; Deer Flat Reservoir and Diversion Dam, Boise Project, Idaho; Arrowrock Dam, Boise Project, Idaho; Minidoka Dam and Powerplant, Minidoka Project, Idaho; Buffalo Bill Dam, Shoshone Project, Wyo.; and Pathfinder Dam, North Platte Project, Wyo.

Diane Gelburd is a Student Assistant Archaeologist for the Bureau of Reclamation and a Teaching Fellow at George Washington University, Washington, D.C.



Most *National Register* Reclamation projects are expansions of early homesteading irrigation attempts. The Carlsbad Project was originally one of the most extensive private irrigation projects ever attempted in the West. It began as a number of stone dams constructed on the Pecos River in New Mexico in the 1880's.

In 1889, the Pecos Irrigation and Investment Company was formed to extend the irrigation project by building a canal and a wooden flume (replaced by one of concrete in 1902). Carlsbad is the only major irrigation project in the country that has retained its original privately built system of stone dams, canals, and flume, while building additional features. On the Carlsbad Project, one can see the evolution from private to public reclamation projects in the arid West.

The Salt River Project in Arizona is a descendant of ancient pre-Columbian irrigation projects. In 1867, Jack Swilling cleared an ancient ditch and began the modern irrigation era in the Salt River Valley. To provide adequate water storage for this historic project and to initiate Federal production of electric power, Theodore Roosevelt Dam was constructed (1906-1911) and became the first major project to be completed under the Reclamation program. Theodore Roosevelt Dam is the world's highest masonry dam. As one feature of the Salt River Project, it has a prominent place on the *National Register of Historic Places*.

Derby Diversion Dam, completed in 1905, was the beginning of the Newlands Project in Nevada. This project was one of the first to be authorized under the Reclamation Act of 1902, and it marked the beginning of construction of Reclamation facilities. In fact, the design

blueprints are marked "Reclamation Specification #1." Before construction of the dam, early settlers of the project area had irrigated their lands by natural flow diversion.

Completion of Conconully Dam and Reservoir in 1910 greatly expanded agricultural activities in Washington State. The dam is significant as an early engineering feat in land reclamation. It was the first Bureau of Reclamation dam to be constructed by the hydraulic fill method. Since there were no precedents, the construction was designed on the job. Fragmented granite and earth from nearby Peacock Mountain was sluiced down to the dam in steel-lined flumes on high trestles. This dam is now a feature of the Okanogan Project.

Buffalo Bill Dam is named after Col. William S. (Buffalo Bill) Cody.

Wyoming's Buffalo Bill and Pathfinder Dams are significant landmarks in arch-dam construction. At its completion in 1910, Buffalo Bill Dam was the highest dam in the world. Buffalo Bill Dam (originally known as the Shoshone Dam) is named after Col. William S. (Buffalo Bill) Cody who made the area famous in the early days of the West. He and his associates were among the first to perceive the possibilities of turning Wyoming's dry Bighorn Basin into an agricultural land through irrigation. In 1899, private individuals constructed a canal on the south side of the Shoshone River to begin irrigation. In 1902 the Reclamation Service was asked to complete the project.

Pathfinder Dam is a masonry dam fashioned from huge granite blocks quarried near the site. One of the reasons for using granite may have been the difficulty construction workers have had in transporting barrels of concrete 47 miles by horse-drawn wagons. Pathfinder Dam, completed in 1909, was the first in a series of dams which provide an intricate interchange of Reclamation waters serving large sections of Wyoming and Nebraska.

Pathfinder Dam on the North Platte River, Wyo.

Once a sagebrush desert, the Minidoka Project area now hosts a combined diversion, storage, and power structure.

As part of the Boise Project, Deer Flat Reservoir (now Lake Lowell) provided storage for a major early Reclamation Service project. Today, while still serving as a reservoir, it has become an important wildlife refuge. Another feature, Boise River Diversion Dam, is a significant *National Register* property because of the survival of an early type of generating plant. It has remained essentially unchanged since its completion in 1908. The powerplant is one of the earliest built by Reclamation and still has its original turbines with wooden bearings.

The Boise Project expanded irrigation that began in the Boise Valley after the 1862 gold discoveries. By 1864 farmers occupied all the land that could be irrigated by direct diversion. The New York Canal was then proposed to expand irrigation. Development of the canal proved to be disappointing, however, since it only increased irrigation by 10,000 acres—rather than the expected 500,000 acres.

The Boise Project was, therefore, proposed and became the first Reclamation project in Idaho.

Idaho's Arrowrock Dam was one of the first features in an orderly program of development for the Boise and Payette Valleys. The project was requested by private irrigation enterprises which began filing on desert lands in the 1880's. At its completion in 1915, the 354-foot dam was the highest dam in the world.

In 1904 the lower Minidoka Project area of Idaho was a nearly uninhabited sagebrush desert with only a few scattered ranches. A few years later, it became a prosperous, highly developed farm area. As one of the earliest Reclamation projects, the earthfilled Minidoka dam has not changed greatly since its 1904–06 construction at a cost of $675,000.

The Minidoka powerhouse, completed in 1913, was the first major Federal hydroelectric plant in the Pacific Northwest. It provided surplus power for public distribution and efforts to market this power resulted in early experiments in space heating of houses and schools. Senator George Norris of Nebraska used this experience with Minidoka power as justification for creating the Rural Electric Administration.

There are many other Reclamation projects being considered for listing on the *National Register of Historic Places.* Early Reclamation projects have a crucial story to tell—about our needs, our economy, our progress in engineering and technology, and most importantly about Reclamation's historic mission.

California Petroglyphs

RECLAMATION'S ROOTS DISCOVERED THROUGH ARCHAEOLOGICAL STUDIES

by Ward Weakly

It's no wonder that some of Reclamation's earliest water resource development projects can be found in the *National Register of Historic Places*. Right there along with Independence Hall and the Liberty Bell is Minidoka Dam and Powerplant, Pathfinder Dam, Buffalo Bill Dam, Theodore Roosevelt Dam; the names themselves hint at the antiquity that has earned those structures a prominent place on the list.

By the various public laws that protect all of our Nation's heritage, Reclamation is charged with identifying and protecting historical landmarks—its own as well as others affected by Reclamation projects—and archaeological finds that might never have been uncovered except for the construction of those projects.

During this drought year, with all of its negative impacts, there has been one positive element. With many reservoirs' levels being lower than they have ever been since the filling, archaeologists are able to research areas that previously were inaccessible.

In some cases, whole towns are now available for study. The town of American Falls has been under water since the American Falls Reservoir in Idaho inundated the deserted city in 1927. Other sites where a lower reservoir level has allowed study are at Shasta Lake in California where a railroad tunnel was uncovered and Folsom Lake, also in California, where many smaller items are being investigated.

Reclamation is just beginning these studies and, as they near completion, more will be learned and written about them.

Other projects Reclamation is working on include proposals to protect and preserve a hotel, barn, tavern, combination laundry/ice house, and a six-unit outhouse—structures built as a resort area high in an historic section of Colorado's Rocky Mountains. These buildings, some of log construction and all dating back to about the time the famous Tabor Opera House was being built in Leadville, Colo., are part of the Interlaken Resort on the shores of Twin Lakes at the Mt. Elbert pumped-storage site.

One of the oldest known locations of human habitation in North America—perhaps 12,000 years old—was discovered during construction of an irrigation project in Reclamation's huge Columbia Basin Project. Known as the Lind Coulee site in northeast Washington, it is one of several finds that give humans a clue about who their ancestors were.

Lind Coulee is representative of the Paleo Indian cultural period and its occupation dates to at least 9,000 years ago. At this site, one of the most complete inventories of tools ever associated with such an early

Archaeologists conduct investigations at Rock Shelter, Utah.

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time period in North America was found preserved. The artifacts recovered included a variety of bone tools—some items are as delicate as needles. Such information allows a much more complete reconstruction of the life of the people who occupied the site, including their clothing, hunting practices, and environment.

Since passage of the amendment to the Reservoir Salvage Act in May 1974, the Bureau of Reclamation has funded in excess of 100 studies of archaeological and historical resources in its project areas. These studies have varied in scope from small investigations aimed at obtaining data from existing documentary records to major efforts designed to mitigate project impacts on the resources.

The result of the cultural resource studies has been a major contribution to our understanding of past lifestyles and cultures ranging from the Paleo Indian period beginning 15,000 to 10,000 years ago to the historic settlement of the 17 Western States within the past 2 centuries.

Ancient needles, made from bone, were found at Lind Coulee, Wash.

Many clues to man's past have been found at the Lind Coulee Site, Wash.

Other kinds of archaeological studies undertaken by Reclamation are surveys made to locate and evaluate the importance of sites within project areas. These kinds of studies have been contracted for projects in the 17 Western States. The results of the surveys have developed a wealth of information covering numerous time periods and different kinds of cultural development. Some of the sites include the Woodland period mound sites along the James River in North Dakota, the rock shelters in Utah, the petroglyphs in California, and a variety of other areas including southwestern Pueblo and Hohokam sites, Plains Village and Tipi Ring sites, and a broad spectrum of less spectacular lithic, camp, and food procurement sites.

Many of the sites located have yet to be studied in any detail, but taken as a whole they have the potential of greatly increasing our understanding of the past. The information that is potentially recoverable varies from region to region and site to site, but it should provide a great deal of information about past human populations, the environment in which they lived, and how the people adapted to their environment.

One of Reclamation's main concerns is to make the public more aware of the history of some of the Bureau's oldest features, like the Minidoka Dam and Powerplant.

When nominated to the *National Register of Historic Places,* the 71-year-old Minidoka Dam and Powerplant was described as being "the earliest Federal hydroelectric plant in the Pacific Northwest still in use." It was a significant landmark because: ". . . it made surplus power available for public distribution; early experiments in space heating were conducted there; and Senator George Norris used his experience with Minidoka power as a basis for justifying creation of the Rural Electric Administration."

The surveys have uncovered a wealth of information about numerous time periods and cultures.

The Bureau has an interest in making available to the public its efforts and the results of those efforts to preserve, maintain, and restore cultural resources. Obviously, not every structure or project feature can be turned into some sort of museum, but those facilities of recognized importance are evaluated in terms of what could be done to make them more accessible to the general public.

Recently, Reclamation approved a general plan to implement the gathering and interpretation of historical material. The plan included hiring a professional historian, whose main project is to write a record of Reclamation's history.

Early Reclamation projects do have a story to tell—about the Nation's needs, economy, the level of its engineering and technology and, most importantly, about Reclamation's mission.

Now, after 75 years, public awareness and understanding of Reclamation's mission is still an important concept, and understanding always seems to be sharpened when placed in an historical perspective.

75 YEARS OF RECLAMATION LEADERSHIP

by David W. Carle

Names of places in the West demonstrate the vital role played by the Bureau of Reclamation in western settlement. Arrowrock, Payette, Fryingpan. But to the student of civil engineering, they also served as a hall of fame of some of the men who guided the Reclamation program in its three-quarters of a century of service—Roosevelt Dam, Lake Mead, Davis Dam.

The leadership of an organization such as the Bureau of Reclamation requires a mixed bag of talents. Most of Reclamation's dozen commissioners have come from the ranks of practicing civil engineers, but not all. One was trained as an economist; another, as a newspaper reporter.

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The leadership qualities required of a commissioner are manifold, running the gamut from a grasp of complex engineering principles to subtle political skills used in dealings with lawmakers. As one of the few Federal agencies authorized to carry through projects from inception, to planning, to construction, and finally administration, the Bureau of Reclamation truly demands much of its chief administrators.

Those who forged the Reclamation program have attempted to accommodate several sweeping and seemingly irreconcilable ideologies of local decentralization and Federal centralization; of private and public interest. The political problems which have beset Reclamation's leaders from the beginning are in several respects an indication of the extent to which the ideological debate has not yet been settled.

One of Reclamation's founders was Frederick Haynes Newell. Born in 1862, Newell was an outstanding engineer who at age 27 had been tapped to be assistant hydraulic engineer for the U.S. Geological Survey (USGS). Later he headed the Survey's Hydrographic Branch—the natural predecessor of the Reclamation Service. Newell was a protege of John Wesley Powell, the western explorer who became the Nation's foremost advocate of the conservation of waters for irrigation of the arid western lands.

Frederick Haynes Newell (1907-1914)

Newell enlisted vice-presidential candidate Theodore Roosevelt in the Reclamation cause, then worked with Roosevelt to build the necessary political consensus. Roosevelt and Newell both heavily imprinted the program with overtones of the great 19th Century conservationist movement which they helped lead.

Arthur Powell Davis (1914-1923)

The Reclamation Act of 1902 chartered the new Reclamation Service and placed it within the Geological Survey. Newell, one of the most respected civil engineers of his time, became its first head, with the title of Chief Engineer. Congress in 1907 detached the Service from USGS and Newell became its first Director.

Director Newell secured congressional authority for several major projects and guided to completion the important Yakima and Salt River Projects.

By 1913, a new Secretary of the Interior, F. K. Lane, determined that intense political pressure from Reclamation water users, stemming from the repayment provisions, required that he reduce Newell's visibility. In an effort to diminish Newell's authority, Secretary Lane invested the leadership of the Reclamation program in a new five-man commission, with Newell's influence being that much lessened.

One of the quintet was Arthur Powell Davis, Chief Engineer of the Reclamation program. Davis was the nephew of John Wesley Powell and was president of the American Society of Civil Engineers.

Davis and Lane began a struggle for control of the agency. Davis, a highly distinguished professional with close ties to the influential conservation and progressive political movements, had immense support both in and out of the Reclamation Service and emerged the victor. In 1914 he was named Director in addition to his post as Chief Engineer. The commission was soon disbanded, and all authority returned to the Director.

Davis served ably as Reclamation's chief administrator for almost 9 years. Davis is noted as the first commissioner to propose construction of multipurpose dams whose powerplants would amortize costs of entire projects.

David W. Davis (1923-1924)

Elwood Mead (1924-1936)

The milieu of the times continued to take its toll of Reclamation's leaders. Secretary of the Interior Herbert Work in 1923 judged that the situation demanded the political and business acumen of a man like David W. Davis (no relation to A. P. Davis). The new director was a former governor of Idaho and, before that, a banker.

Davis had been born in Wales in 1873 and worked as a coal miner before migrating to Idaho. After holding several elective offices and founding and presiding over a bank, Davis was named to the Reclamation directorship. During Davis' 9 months in office, the Reclamation Service was renamed the Bureau of Reclamation and the title of its top officer was changed from "Director" to "Commissioner."

Succeeding to the job next was Elwood Mead, an engineer

and scholar of international repute and one of Reclamation's most remarkable leaders.

Born in 1858, Mead was trained as a land surveyor and very early drew respect for his work. He was appointed to the first chair in agricultural engineering ever established at an American school, Colorado State College of Agriculture. Later, as State Engineer in Wyoming, Mead drafted a milestone irrigation code which was to revolutionize arid land irrigation law and to lessen the years-long strife in the West between adherents of riparian law and proponents of "diversion and use" legal precedents. His code declared all waters to be the property of the State, and that the State must consent to any and all irrigation.

In 1899 he was appointed Chief of Irrigation and Drainage Investigations of the U.S. Department of Agriculture, where he also became an expert in rural economics. Because of his expertise he was called to Australia to help assess the extremely difficult rural problems besetting that nation. He set up a model planned settlement program which was later adapted for use in other parts of the world. Mead's years in Australia convinced him that planned rural development could overcome the kinds of hardship and incohesiveness which at the time were widespread in rural America. He would apply this lesson as Commissioner of Reclamation.

In 1923 Mead was appointed to a special Fact Finders Committee which studied the Reclamation program to make suggestions for its improvement. At that time the agency had assembled an outstanding engineering record, but unrealistic repayment provisions in the founding legislation were responsible for much misery among project residents.

A year later Mead was named Commissioner. He served for 13 years and during his active tenure Reclamation, in many crucial respects, was made over. He convinced the Congress to schedule construction repayments on the basis of land productivity and bent the agency toward a new course of greater sensitivity to human needs.

He led the Bureau into its new role as a multipurpose water resource agency, epitomized in the extraordinary Boulder Canyon (Hoover Dam) Project, for which Mead won congressional authorization in 1928. He later administered the Bureau's great growth as it became a vital component of President Franklin D. Roosevelt's public works program.

John C. Page
(1936-1943)

Mead died while still in office at the age of 78, 4 months after dedication of Hoover Dam. The dam's reservoir appropriately is named in his honor.

Other of Mead's suggested reforms were brought to fruition in the Reclamation Project Act of 1939—one of the most significant events in Reclamation history—during the term of Commissioner John C. Page.

Harry W. Bashore
(1943-1945)

Page, born in 1887, was advanced to the vacancy created by Mead's death after a long and honored career in the field of reclamation. During his time in office (1936-1943), the first power was generated at the massive Grand Coulee Dam Powerplant.

Page served the Bureau for 4 years as a consultant after leaving the Commissioner's office. The town of Page, Ariz., at Glen Canyon Dam was named in his honor.

Following Page as commissioner was Harry W. Bashore (1943-1945), another veteran of several Bureau operations.

Bashore was born in 1880 in Missouri. He joined the Reclamation Service as an engineering aide after graduating from the University of Missouri and steadily advanced through a variety of assignments.

Commissioner Bashore won congressional authorization for the Missouri River Basin Project, thereby satisfying many who were calling at that time for creation of a Missouri Valley Authority. Other accomplishments during his term include completion of the Shasta Dam Powerplant and creation of the Bureau's regional offices system.

After retiring from office, Bashore served as a consultant to the Israeli Government and to the World Bank in India and Pakistan.

Michael W. Straus (1945-1953)

Wilbur A. Dexheimer (1953-1959)

Commissioner Michael W. Straus (1945-1953) came to the post from quite a different background. Born in Chicago in 1897, Straus became a newspaper reporter, eventually a managing editor of two of the Nation's largest newspapers. He was the Washington bureau chief of a major news agency when called to be an assistant to Harold Ickes who, at that time, was both Secretary of the Interior and Director of the Federal Public Works Administration.

Straus drew the wrath of Senator Sheridan Downey of California, who was critical of Reclamation's close enforcement of the 160-acre provision of the Reclamation law. Downey attached a rider to the Interior Appropriations Bill of 1948, denying salaries to Straus and Richard Boke, head of Region 2 (whose area included the Central Valley Project in California), through the device of requiring that Reclamation commissioners and regional directors be engineers. Straus and Boke maintained the support of President Truman and the Secretary of the Interior. They stayed on the job without pay, and after 8 months their salaries were restored by the next Congress.

During his administration Straus completed a 4-month tour of reclamation projects around the world as a representative of the State Department. Also during his term, the Upper Colorado River Basin Compact was signed, Grand Coulee and Shasta Dams were dedicated, and the Bureau's Engineering and Research Center at Denver was completed.

Replacing Straus was Wilbur A. Dexheimer (1953-1959), who had logged substantial engineering expertise in several civil, corporate, and Reclamation posts.

Dexheimer was born in Denver in 1901. Soon after leaving school he won a reputation as an outstanding engineer. He joined Reclamation and served with the survey party which fixed the location of Hoover Dam on the Colorado River in 1929. Later he worked on construction of that dam, on the Bartlett Dam in Arizona, and on Shasta Dam in California.

He entered the Army during World War II and served in India and China as Assistant Theater Engineer on the staff of General Joseph Stilwell. After the war he returned to the Bureau of Reclamation and within 6 years was appointed commissioner by President Eisenhower.

He accompanied the President on a tour of proposed Reclamation works in the Colorado and Missouri river basins in 1954 and on a drought survey of the Southwest in 1957. Also during his term came congressional approval of the Central Valley Project's Trinity River Division and of the Colorado River Storage Project, and enactment of the Small Reclamation Projects Act of 1956.

The decades of the 60's and the 70's have been trying ones for Reclamation. Administrators of the Bureau of Reclamation during this period were Commissioners Floyd E. Dominy (1959-1969), Ellis L. Armstrong (1969-1973), Gilbert G. Stamm (1973-1977) and now, R. Keith Higginson (1977-). All of the three most recent past commissioners are alive today.

Floyd E. Dominy

Floyd E. Dominy was a supremely confident and purposeful commissioner whose faith in Reclamation began on the arid central Nebraska plains where he was born in 1909. His parents' farm—near the 100th meridian, which seems to define the boundary between the arid West and the humid East—was in an area largely dependent upon Reclamation works. The concept of Reclamation so impressed Dominy as a youth that he crammed photos of penstocks and pumping plants into his childhood photo album.

These consuming interests led Dominy through agricultural economics and liberal arts degrees at the University of Wyoming and to an appointment as a county agent in the rangelands of northeastern Wyoming.

It was precisely at the time that the Great Drought was combining with the Great Depression to spread misery wholesale among western and midwestern farm families. Compelled by a deep appreciation of the tragedy and by an abiding faith in what he had seen Reclamation accomplish elsewhere, Dominy launched what he calls his own county-wide emergency relief "reclamation program." The "program" often involved only himself and a tractor, which he'd use to plug small streams on the range to impound small ponds of water. These scores of small impoundments spared uncounted animals and helped save the assets of many a household. After service in the Naval Reserve, Dominy joined the Bureau of Reclamation in 1946 as a land specialist and advanced steadily through to his appointment as commissioner in 1959.

Commissioner Dominy infused his enthusiasm for the promise of Reclamation into every realm of the Bureau's operations. He pressed the Congress for approval of those projects he knew were worthwhile and pressed just as forcefully to steer the Congress away from actions he thought unworthy of the Reclamation program. For example, he offered crucial testimony against the proposed Ramparts Dam on Alaska's Yukon River.

He tangled more than once with private power interests through his arguments for Federal marketing of the power generated at Reclamation powerplants.

Slides and other visual aids became stock features of Dominy's appearances on Capitol Hill early in his term. He recalls that the first time, "I used lots of color pictures while I described the project under discussion, and the committee members liked it. As a matter of fact," he says with a grin, "they directed the [Army] Corps [of Engineers] to do it from then on."

He could be a forceful witness in the hearing room. But, says he, "I've never lost my cool in Government work unless I thought it was to my advantage."

A senior committee staffer calls Dominy "the most powerful lobbyist then on the Hill. He played congressional committees like an orchestra."

Dominy attributes his effectiveness with the Congress to frankness and preparation. "I had complete candor," he says. "Never at any time did I try to bluff. I studied my lesson and when I went up to the Hill I was confident that I knew more about the matter I was discussing than did anyone else. It was the product of hard work and long years of familiarity with the West. And . . . I have a universal curiosity."

Dominy is a firm believer that Reclamation benefits are felt, but perhaps not recognized, throughout the Nation as much as they are felt in the West. "The development and settlement of the West, to a significant degree, has strengthened the whole U.S. by strengthening individual States of the West," he says.

The former commissioner's favorite examples often are drawn from the Colorado River Storage Project. Glen Canyon, Flaming Gorge, and Navajo dams of the project were completed during the Dominy years.

He played congressional committees like an orchestra.

From his Shenandoah Valley ranch Dominy says, "If you were going to develop the Colorado River based on an unregulated flow, you could only plan on a population that could be supported by about 5 million acre-feet of water because that's all you can count on to be there year to year. Instead of that, we have some 15 million acre-feet available through Reclamation's regulatory facilities, and that difference has made possible the tremendous development of the Southwest. And the same is true of the Bureau's work in the Columbia River Basin."

But despite these good works, says the former commissioner, "I don't think the general public has great knowledge of the problems and how they have been solved to bring us up to this point. Most people in the West have always been able to go to the tap, turn it, and get water. I suspect that if you took a survey among the people along the coast in southern California, you would find that very few realize that the bulk of their water comes from Lake Mead and Hoover Dam and the regulation along the Colorado River."

Consolidation of Federal natural resource agencies has been proposed often in the 8 years since the Dominy administration. Dominy says that he often flirted with the idea, too. "I was always very conscious of the fact that we had agencies dealing with water and agriculture that went to one committee, the Corps of Engineers went to another, and the Bureau of Reclamation went to a third; I always thought it was a helluva way to do business.

"Early in my career I would have urged, and did urge to the extent that I could, the principle that they ought to be combined. Later I recognized the fact of life that there was no way that any President was going to get by with taking the Corps away from the Defense Department and put it into Interior, or the watershed program away from Agriculture. So my approach to the problem revolved around more liaison than had been attempted before. Why should the Corps be building major works such as storage dams and regulatory structures in the West, where jurisdiction historically had fallen on the Bureau of Reclamation?

"I had a pretty good movement underway during my first year and a half as commissioner: the Corps would voluntarily step aside on my projects in the Western States in which the aim was more than flood control. And I had similar understandings with other agencies.

"There's a threat to be considered with any consolidation," Dominy continues. "Bigness doesn't necessarily mean efficiency. And a constant rivalry within the Federal Government isn't such a bad thing. Monopoly in any form hasn't performed too well historically."

The former commissioner today devotes most of his energies to raising beef cattle on his ranch in Virginia's Shenandoah Valley, where he continues to wear the familiar Stetson and string tie which contributed to the colorful Dominy legend.

Ellis L. Armstrong

As a boy, Ellis L. Armstrong wanted to be a Bureau of Reclamation engineer the way other youths wanted to be firemen or policemen or President of the United States.

He got his wish, and then went on to become Commissioner of Reclamation during a crucial period of the Bureau's history.

Armstrong was born in 1914 in Cedar City, Utah, and was raised, there and in Idaho, on irrigated farms in small communities organized, built, and maintained by Mormon settlers. Small mountain streams were harnessed to allow the settlers to scratch livings out of the dry soil. The mountain streams were the settlers' lifelines and their waters were fought over with appropriate intensity. He saw neighbors, who otherwise were the best of friends sometimes, "tromp each other in the ditch" over water disputes. The whims of nature toyed with the settlers' livelihood. Armstrong watched his father agonize while the family's entire savings were washed away in one year by Idaho's unregulated Snake River.

Armstrong never had any boyhood inclinations to pursue a career in anything but water resource engineering. While a student at Utah State University, he spent one summer as a technician for a CCC construction crew on Reclamation's Strawberry Feeder Canal.

He graduated at the head of his class and was offered a job with Reclamation's Salt Lake office. He started the day after graduation.

He was put to work first on Colorado River hydrology studies and by 1937 was the materials engineer on the Deer Creek Dam project—Reclamation's first large-scale municipal development.

He served as office engineer and field engineer during construction of Anderson Ranch Dam. Anxious for design experience, Armstrong next got an assignment in the Bureau's Denver office, where he supervised the design of some three dozen dams.

Later, at the age of 32, he became one of the youngest construction engineers ever assigned to a major project—in this case, the Trenton Dam of the Missouri River Basin Project.

In 1953 he was detailed to the State Department as a member of the Egyptian Rural Improvement Commission, created to examine development problems associated with the Aswan Dam.

After returning briefly to Reclamation, Armstrong became project engineer and deputy project manager of the St. Lawrence Power and Seaway Project. The work was completed in less than half the time originally estimated and was still accomplished within the original budget.

Armstrong was a member of the Egyptian Rural Improvement Commission, created to deal with the Aswan Dam.

Returning to Utah in 1957, he was appointed State Director of Highways. A year later he was appointed U.S. Commissioner of Public Roads. In that post he helped inaugurate the Nation's Interstate Highway System and was the approving authority for most of the system's urban area locations. He launched public hearings to handle the extremely complex and controversial problems associated with the site selection and emerged with "a great deal of admiration of people and their sound judgment once they're allowed to get an understanding of the problems, the program, and the constraints imposed on the engineers." It is a philosophy he would bring to the Bureau of Reclamation.

He entered a private, worldwide consulting practice in 1961. Then, in 1968, Armstrong returned to the Bureau as Assistant Regional Director in Salt Lake City. The following year he succeeded Floyd Dominy as Commissioner.

Armstrong took over the Reclamation program at a time of great flux. By 1969 the Bureau of Reclamation had built an impressive record and by most assessments was the foremost engineering organization in the world. But Armstrong saw a need for the Reclamation program to develop that same level of competence with the "soft areas" of environmental and urban planning and with the subtleties of what Armstrong terms "people relationships."

"I felt the need for rejuvenation . . . for reappraisal," Armstrong recalls today. "I felt we were looking too much back toward 'the golden days of Reclamation,' symbolized by Hoover Dam, the Columbia Basin works, and the Central Valley Project. We were not paying enough attention to some of the social problems which were emerging, some of the changes in what should be done with our projects, some of the side effects which were becoming more and more apparent as we got involved in more urbanized areas. I felt that we needed some change in direction, greater emphasis on environmental problems, greater development of water for urban needs, and a new look at some of our agricultural projects."

He set out to lead Reclamation successfully into what he termed, "The Environmental Decade."

To encourage greater intra-Bureau coordination, he abolished the position of Chief Engineer. He established four assistant commissionerships—for resource planning, resource development, resource management, and administration—and appointed a special advisor for environmental problems. Then he invested greater authority in the regional offices, which were given increased responsibility for smaller projects.

Next, Armstrong redoubled Reclamation's efforts to consider fully all environmental factors involved in Reclamation projects. By the time the National Environmental Protection Act (NEPA) became law, much of the environmental planning which thereby became required by law already was well underway in the Bureau. Reclamation for two decades prior to NEPA had been coordinating its activities with other agencies whose realms of responsibility included those environmental factors. The first Environmental Impact Statement submitted to the new Environmental Protection Agency—perhaps even the first several of them—was submitted by the Bureau of Reclamation.

Against much resistance and during a time in which Reclamation was forced to cut back its personnel, Armstrong committed

the Bureau to building a good, solid staff of professionals to comply both in spirit and in letter with NEPA.

Armstrong also sought to open new channels of communication between Reclamation and the Nation's environmental interest groups.

"It took time," Armstrong says of the heightened environmental emphasis in Reclamation's operations, "but I think we soon got the concern for environment well imbued into all of our planning, design, and construction operations. I'm quite proud of that accomplishment."

Armstrong envisions a continuing important role for Reclamation in a future now being defined as the Nation puts together a comprehensive water policy. "In the water resources and management area," says Armstrong, "the competence that we have in the Bureau in design, engineering, and administrative abilities has no rival anywhere. We certainly should encourage the Government to take advantage of the expertise which has been built up. I see a very important role for the Bureau to play in the future."

Since leaving office, Armstrong's energy has been diverted into several efforts. He has edited *The History of Public Works in the United States* for the American Public Works Association, is assembling a public works administration program for the University of Utah, and is putting together a worldwide inventory of the world's existing and potential hydroelectric energy resources for the World Energy Conference.

Gilbert G. Stamm

Those who knew Gilbert G. Stamm as Commissioner of Reclamation knew him as a man of few words, who brought a top-to-bottom knowledge of Reclamation to the job, along with a firm reputation as a doer.

Stamm's administration began in 1973 and ended when he left office in 1977.

Gilbert G. Stamm—a man of few words.

As commissioner, Stamm had exceptional standing with congressional committees where his thoroughness and his economics training were much appreciated. Stamm's effectiveness in dealing with Reclamation's congressional and public constituencies rivaled that of Commissioner Floyd Dominy. But the styles of the two men were markedly different. Whereas Dominy, in his words, "would put all my chips in the pot and either win it all or lose my shirt," Stamm preferred to keep the Reclamation program on the move though a studied search for consensus. One observer praises Stamm's "quiet competence" and his ability to keep the Reclamation program on a steady course in rough waters.

Stamm was born in 1911 in a Reclamation city—Denver, Colo.—and had been impressed at an early age with irrigated agriculture. He studied engineering and economics at Colorado State University.

He began a distinguished Government service career in 1936 when he joined the Agriculture Department's Land and Water Resources Division, where he helped administer the land use adjustment program. His work in the Northern Great Plains during the Dust Bowl years convinced him of the

critical need in the West for well-conceived water management planning.

From the Great Plains, Stamm was moved to the west coast where he conducted a six-State inventory of development opportunities through the application of irrigation, drainage, and land clearing techniques.

In these and other USDA positions, Stamm worked closely with the Bureau of Reclamation and developed such an appreciation of the Reclamation program that he joined the agency in 1946. He obtained a valuable overview of the Bureau's work, first through his association with allocations and repayments functions in the Boise regional office, and later when he served as assistant regional supervisor of operations and maintenance.

He was brought to Washington, D.C., in 1959 and was installed as Chief of the Division of Irrigation and Land Use. Five years later, Commissioner Dominy tapped Stamm as Assistant Commissioner with responsibilities for planning, water and land operations, foreign activities, Youth Conservation Corps, and later, for legislative liaison.

Stamm's reputation as a doer continued to grow. When the Bureau was reorganized in 1970, Stamm was given charge of all Reclamation power activities.

His appointment as Commissioner in 1973 allowed him to apply his wealth of experience in the Bureau's operations and maintenance activities to strengthen ties with water users.

Commissioner Stamm took the reins at a time when Reclamation was under fire from several quarters. He is credited with establishing superior relations with the Congress which lead to the highest appropriations for construction in Reclamation's history.

Reflecting upon decades of rapid change in the Bureau of Reclamation and on the prospects for future evolution of its mandate, Commissioner Stamm sees a common thread running throughout Reclamation's turbulent history. "Our charge has always been to help people," he says. "In the beginning, the Reclamation Service did that by tackling the problems of the arid West through irrigation. But even in the early days of Reclamation, the program's functions began to multiply under the direction of the Congress.

Stamm's reputation as a doer continued to grow.

"Reclamation today is interested in all sources of water, and in all uses to which water can be applied. It's clear that we have to coordinate those functions closely in order to maximize the benefits for all. In doing that we inevitably run into conflict because the interests of the public at large and of various smaller publics are different.

"For instance, a man interested only in irrigation wants the reservoir to be full. A man interested only in flood control would like to see the reservoir empty. The recreationist wants a constant level and the fish and wildlife interests want a constant streamflow.

"The job of blending those functional uses to maximize the benefits for all has been given much greater emphasis by Reclamation in the last few years through the Total Water Management studies. It is not a new concept, merely a greater emphasis on something that has been going on for years."

"Something else which has been going on for years in Reclamation," says Stamm, "is controversy of one kind or another. The program and its purpose has been embroiled in controversy since the start."

The former commissioner recalls that even the two most familiar symbols of Reclamation's success— Hoover and Grand Coulee Dams—were targets of ridicule at the times of their proposal and construction. Today, he notes, Hoover is recognized as one of the greatest single Federal investments ever made in the American Southwest and the one with the most impressive and far-reaching benefits, and the same is now being said of Grand Coulee Dam and its impact in the Northwest.

"Power and water produced at the two features helped carry the Nation through the World War II war effort," Stamm says, "and the regional and national benefits continue to mount year by year.

"Periodically, and in connection with every major project that Reclamation has ever undertaken, there has been controversy," Stamm says. "The basis of the criticism has varied from time to time; currently it is environmental issues and cost-benefit ratios and such. But you can take what were considered to be the poorest or most borderline projects that were built some years ago and take a look today at what has developed in the meantime and you find that the benefits have multiplied to the point that it's hard to understand the original criticism of them. The dividends they have paid on the original investments can easily be demonstrated."

Stamm is confident that a major role for Reclamation in aiding the West will continue. "Even if there were no new facilities to build, there is a lot of room to increase the efficient use and reuse of water. For safety and esthetic reasons—and to minimize evaporation—some systems need to be modernized. Also, we will have to improve our treatment of irrigation return flows for reuse.

"I think a lot of frustration and many uncertainties lie ahead for Reclamation," Stamm says, "but no matter what takes place organizationally, I believe that the continued development of the meager and erratic western water resources will and must continue."

Today, Hoover is recognized as one of the greatest single Federal investments ever made.

As commissioner, Stamm encouraged long-range water resource planning in the West and warned that a lack of planning could push the West, and the Nation, to the brink of a water crisis. "We've got to get away from the pattern of making so much of our national policy in response to crises," he says.

He adds that the Bureau of Reclamation has the capacity to be flexible and to take a new and expanded role in national water development, conservation, and management.

R. Keith Higginson
Present Commissioner

Pipe Spring Ranche

Windsor P. O. Dec. 22nd 1871

This monument was erected December 22nd 1871 by order of the U. S. survey of the Colorado river. This point is thirty nine degrees and forty minutes (39°-40') South of west of a red mound seven miles south of Kanab, Utah Territory, over which pass a meridian line from which this point was triangulated. From here said point reads thirty nine degrees and forty minutes (39°-40') north of East, distant about fifteen (15) miles. Variation of the needle fifteen degrees and twenty minutes (15°-20') east. Added.

Major J. W. Powell, Geologist.
Professor A. H. Thompson, Astronomer.

D. F. L. Jones, Observer.

Notations made while
John Wesley Powell and A. E. Thompson
surveyed the Colorado River.

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Bureau of Reclamation
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